Approved per signature page

SERVICE MODULE

MEDICAL OPERATIONS

[MO]

BOOK 1

REFERENCE MANUALS

SM

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Revision Log

1E	-25-Sep-00	5-19E	-25-Sep-00	6-41E	-25-Sep-00
2E	-25-Sep-00	5-20E	-25-Sep-00	6-42E	-25-Sep-00
3E	-25-Sep-00	5-21E	-25-Sep-00	6-43E	-25-Sep-00
4E	-25-Sep-00	5-22E	-25-Sep-00	6-44E	-25-Sep-00
5E	-25-Sep-00	5-23E	-25-Sep-00	6-45E	-25-Sep-00
6E	-25-Sep-00	5-24E	-25-Sep-00	6-46E	-25-Sep-00
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For notes

For notes

ACRONYMS AND ABBREVIATIONS

АД	- arterial blood pressure
Б/И	- crew procedure
БП	- power supply unit
ВАП	- venous-arterial pulsogram
ВБ	- cycle ergometer
ВКЛ	- activate
ВПГ	- temporal pulsogram
ВЫКЛ	- deactivate
ГИ	- impulse generator
ЗАКР	- close, closed
ИМ	- mass measurement device
ИММ	- small mass measurement
ККГ	- kynetocardiogram
ОДНТ	- lower body negative pressure, LBNP
ОТКЛ	- deactivate
ОТКР	- open, opened
ПИТ	- power
ПВК	- LBNP prophylactic system
ПКО	- biomed harness
ПМО	- medical exam panel
ППС	- systems power panel
ПУ	- control panel
РБС	- onboard power outlet
РМ	- workstation
РПГ	- rheogram
РЭГ	- rheoencephalogram

СЛГ - personal hygiene articles
СОМП - medical care articles

ТНК - training-loading suit

УСИ - sensor unit
УС - Matching Unit
УСВ - MASS MEASUREMENT PANEL

ЦИ - digital indicator

ЧСС - heart rate
ЧП - pulse rate

ШКО - biomed cap

ЭКГ - electrocardiogram, ECG

ДнаЗ - **Report to MCC**
ДпоУЗ - **√MCC**

кан - channel
кн - pushbutton, pb
кбл - cable
клав - pushbutton, pb

п - section
пан - panel
перекл - switch, sw
поРЭ - crew preference
поУЗ - **on MCC GO**

рзм - connector
р/г - radiogram
Рис - figure

СвД - LED, light emitting diode
с/с - comm pass
стр - p, page

Табл - table

□	- illuminated
■	- not illuminated
▚	- blinking
▬	- illumination status changes when command is issued
↷	- rotate clockwise
↶	- rotate counterclockwise
↷̲	- rotate clockwise to stop
↶̲	- rotate counterclockwise to stop
→	- place physical device in designated state or record data in Table
→|←	- connect
←|→	- disconnect
↑	- upward, up
↓	- downward, down
	- sw → On (i.e. up relative to label on panel)
	- sw → Off (i.e. down relative to label on panel)
	- press pushbutton
	- press pushbotton to lock
	- press pushbutton to release
	- verify
	- verify aurally
√	- check (in case of discrepancy, attempt a corrective action one time only)
12:35:20	- 12 h 35 min 20 sec
:30:	- 30 min
::10	- 10 sec
:35:20	- 35 min 20 sec
03::	- 03 h
:05:	- 05 min
::08	- 08 sec
P	- pressure
T.0	- AOS time
T.KTM	- LOS time
**********	- an anticipated off-nominal situation, if the condition left of the asterisks
**********	on the same line is not met, perform action(s) enclosed by asterisk
**********	lines
********** Sect. 5	- an anticipated off-nominal situation, if the condition left of the asterisks on the same line is not met, proceed per indicated reference
********** **√MCC**	- an unanticipated off-nominal situation, if the condition left of the asterisks on the same line is not met, halt procedure execution and **√ MCC**

1. GENERAL INSTRUCTIONS

These Medical Operations crew procedures are intended for trained crew members who have completed the full training course and simulations

These crew procedures may be updated pending systems modifications and procedure validation at simulators and training facilities

1.1. CREW RESPONSIBILITIES

While performing operations, the crew is responsible for the following actions:
Perform operations per these crew procedures
◅ systems and equipment operation
Report to MCC completed operations and performance of systems and equipment

When there is a deviation from nominal systems operation, the crew is responsible for the following actions:
Power down the failed hardware (if necessary)
Record the time when the deviation (malfunction) was detected
Record the nature of the deviation (malfunction)
Report to MCC

1.2. CREW PROCEDURES WORKING SEQUENCE

Obtain source data from **MCC**
◅ sufficiency of the received data
Schedule a command output sequence (if necessary)
Perform setup steps
Perform the indicated actions, while monitoring systems operation
Perform closeout steps
Measurement results should be entered into Laptop or recorded in corresponding tables provided in the crew procedures
Prepare a report:
on completion of tasks
on any detected peculiarities or deviations (with a time stamp)

For notes

2. BIOENVIRONMENTAL SURVEILLANCE

Equipment Usage:

Removal of food waste products
Periodic cleaning of compartments with vacuum cleaner
Wet cleaning

2.1. PERIODIC CLEANING OF COMPARTMENTS WITH VACUUM CLEANER

Required Hardware:

Vacuum cleaner

NOTE

1. Vacuum cleaner continuous operation time should not exceed 30 min After that, stop motor for at least 10 min
2. Replace dust collector bag every 10 days

1. Power cord →|← vacuum cleaner
   Power cord →|← РБС 20 power outlet
2. ⏻РБС 20
3. Power switch on vacuum cleaner → ON
4. Using vacuum cleaner, clean all external surfaces and accessible zones behind panels
5. Turn vacuum cleaner off in the reverse order
6. Stow dust collector bag in container

2.2. WET CLEANING

CAUTION
Never use wet wipes for cleaning electrical connectors

NOTE

1. During cleaning, perform visual inspection of the ISS interior and hardware surfaces, including known dust and condensate collection areas. Look for any discolorations that may resemble growing mold or fungal colonies
2. In the event of finding such colonies on both metal and non-metal surfaces, they should first be dryed with available hygiene tissues or towels, and then treated with specialized antifungal agents, such as cleansing wipes for surfaces and wipes from Fungistat kit (see Sect. 2.2.3. p. 2-4)

Required Equipment:

Microbial Growth Wipes Kit
- Package containing wipe 10 ea.

Fungistat Kit
- Package containing wipe 5 ea.
- Package containing rubber gloves 1 ea.

2.2.1. PERIODIC WET CLEANING

(once every 7 days)

1. Perform cleaning using one wipe from kit labeled Microbial Growth Wipes
2. Clean hands using wet wipe from Sanitary hygiene kit
3. Discard used wipes

2.2.2. OVERALL WET CLEANING

(once every 14 days)

NOTE

1. Overall wet cleaning is performed by two crewmembers
2. Four wipes are used during cleaning
3. During cleaning, carefully wipe all surfaces of ISS interior and equipment

1. Using first wipe clean table, seats, refrigerator, rubber flaps of waste products bag (at the table) strictly following the order

2. Using second wipe clean hatches, hatchway handrails strictly following the order

3. Using third wipe clean cycle ergometer, treadmill handrails and surface, wall panels and surfaces of toilet cabin in the most contaminated areas strictly following the order

4. Using fourth wipe clean walls of toilet and surfaces of the toilet urine funnel strictly following the order

5. Clean hands using wet wipe from Sanitary hygiene kit

6. Discard all used wipes

2.2.3. CLEANING WITH FUNGISTAT KIT

CAUTION

All activities with Fungistat wipes should be performed while wearing rubber gloves

NOTE

1. Fungistat wipes are used to treat areas suspected of having mold or fungal colonies (based on the results of visual inspection or **on MCC GO**)
2. Use one package for treatment of 1.5-2 m^2 area

1. Unstow Fungistat kit
2. Remove necessary number of Fungistat wipes and rubber gloves
   Don rubber gloves
3. Seal the drainage aperture on package with protective film from adhesive plaster
4. Cut off the color strip on the package mouth, using scissors (to open leaf valve)
5. Open leaf valve, by pulling it apart
   The leaf valve cone part →|← condensate water recovery system [CPBK] dispenser
6. Add 75 ml of cold water into the package
7. Wring any remaining drops of water in leaf valve back into the package
8. The package ←|→ the dispenser
9. Squeeze the wipe back and forth (to enable dissolution of disinfectant, contained in the wipe)
10. Open package with scissors from the side opposite the leaf valve
    Remove wipe

11. Perform surface cleaning

12. Discard used wipes into packages
    Discard packages with used wipes

13. After 60 min, repeat cleaning (see Steps 2-12 pp. 2-4, 2-5)

14. When complete:
    Wipe rubber gloves with a dry tissue from the Sanitary hygiene kit
    Stow gloves in their package
    Stow package with gloves in Fungistat kit

For notes

3. PERSONAL HYGIENE OPERATIONS

3.1. UNDERWEAR

Set of undergarments:

shirt
underpants
2 pairs of socks (in a plastic bag with the size indication)

Change underwear once every 7 days
Change socks every 3 days

Kamelia-SM Set - worn during physical training:

sweatshirt with short sleeves and round collar	1 ea.
shorts	1 ea.
socks	1 pair
plastic bag	1 ea.

Change Kamelia-SM set once every 3 days
Wear for three days, then put aside to wear for one more day
only during physical exercises

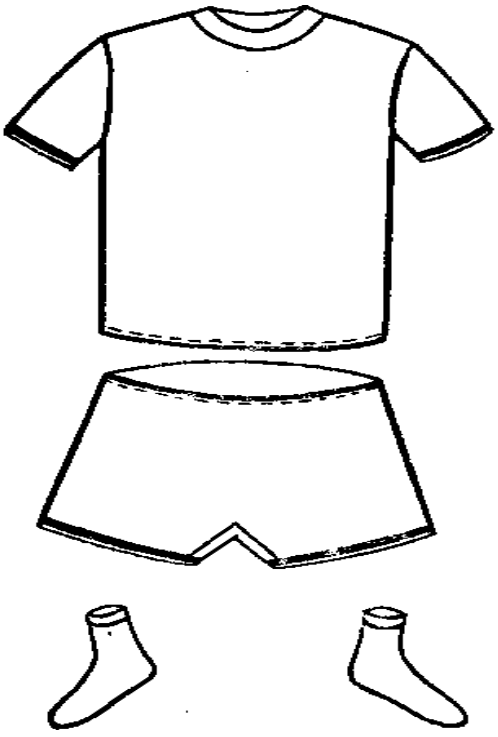


Figure 3.1 Kamelia-SM Set

Disposable underwear set - for everyday wear:

disposable underwear (one-size-fits-all briefs, individual)	4 pairs
plastic multipocket	4 ea.
plastic bag for disposable underwear	1 ea.

Wear one set for four days

Confection set – for everyday wear:

briefs
sportsbra or tanktop (individual)
plastic bag for each confection set
bigger plastic bag for confection sets stowage
Confection sets come in individual sizes

Wear one set for three days

Swimsuit – for use during shower

One-piece swimsuit made from elastic stockinet
One or two swimsuits (depending on the mission length)
Swimsuits come in individual sizes

Casual wear set — intended to provide for crew body temperature comfort during their stay in the ISS with ambient air temperature range of 20-30°C and is used for everyday wear:

polo shirt with zipper made from dense cotton stockinet
shorts with zippered pockets

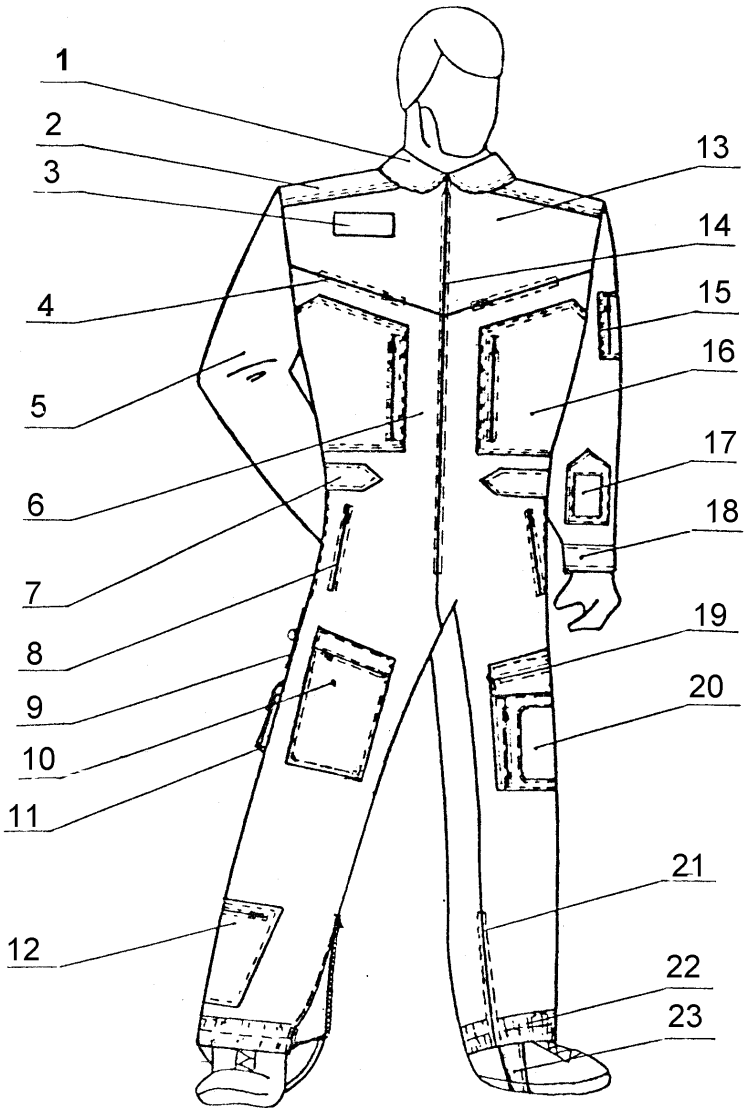
Each plastic bag is labeled

3.2. CHANGE COVERALLS

Change coveralls maintain crewmember's comfortable body temperature under ISS ambient air temperatures in the range 20 - 30°C.

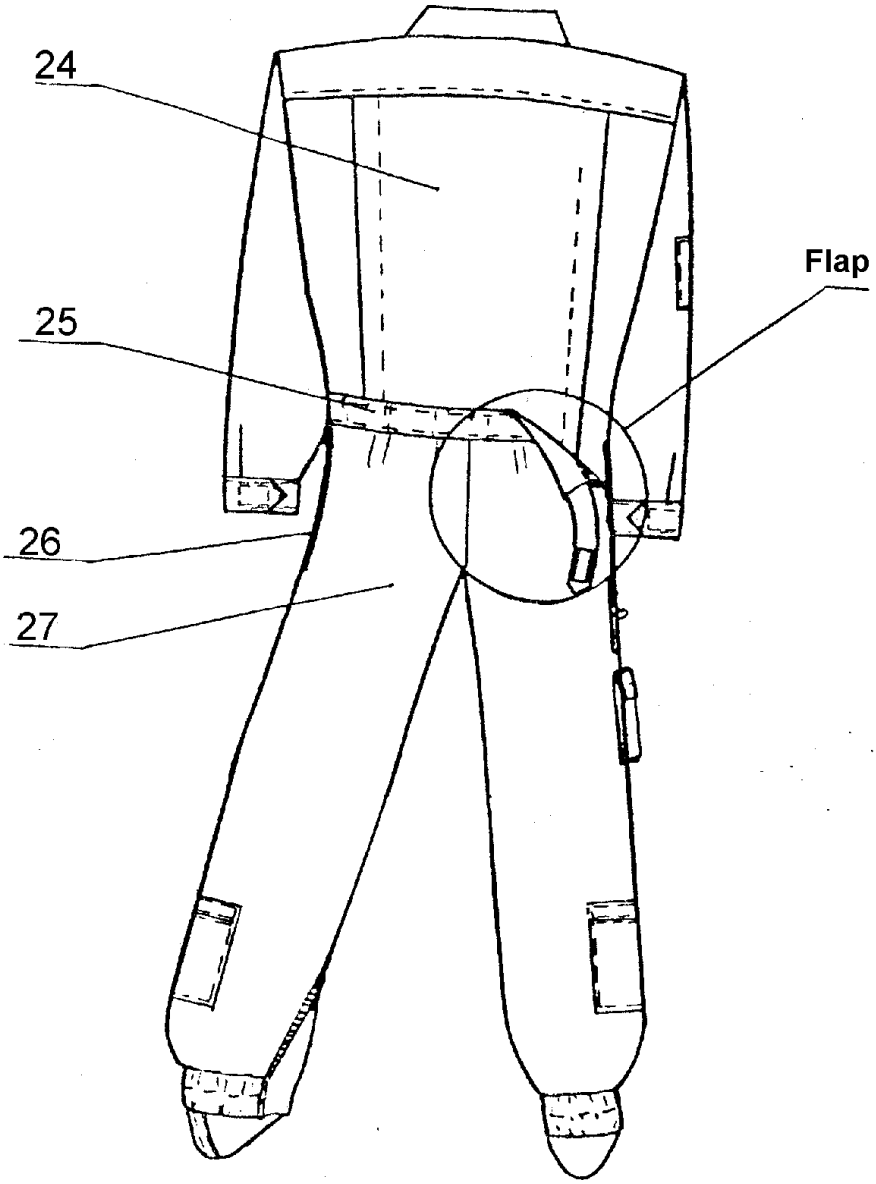
Coveralls have several types of pockets to hold documents, memos, photos, pencils, ballpoint pens, knife, etc.

Coveralls have lateral seams in thigh area with zippers. Upper part of coveralls backside with waist belt and lateral zippers forms a turndown flap (see Figure 3.2, p. 3-4 and Figure 3.3, p.3-5), allowing to use toilet without doffing coveralls.



1 - collar
2 - back yoke
3 - ID card pocket
4 - breast pocket (internal)
5 - sleeve
6 - coveralls front part
7 - belt
8 - frame pocket
9 - loop
10 - thigh pocket (right)
11 - pen-knife pocket
12 - shin pocket
13 - front yoke
14 - central zipper
15 - shoulder pocket
16 - breast patch pocket
17 - electronic calculator pocket
18 - sleeve cuff
19 - thigh pocket (left)
20 - pocket with transparent window
21 - coveralls pants bottom zipper
22 - pants leg cuff
23 - foot loop

Figure 3.2 Change coveralls (Front view)



24 - back with tucks
25 - self-belt
26 - lateral zipper
27 - coverall pants back part

Figure 3.3 Change coveralls (Back view)

3.3. WARM COVERALLS

Warm coveralls maintain crewmember's comfortable body temperature under ISS ambient air temperatures in the range 15 - 20°C
Comfortable temperatures are characterized by preservation of relatively high work capability

The trouser legs of the coveralls are cuffed

Coveralls have upper and lower patch pockets on the left and right

Rounded collar has a Velcro strap fastener

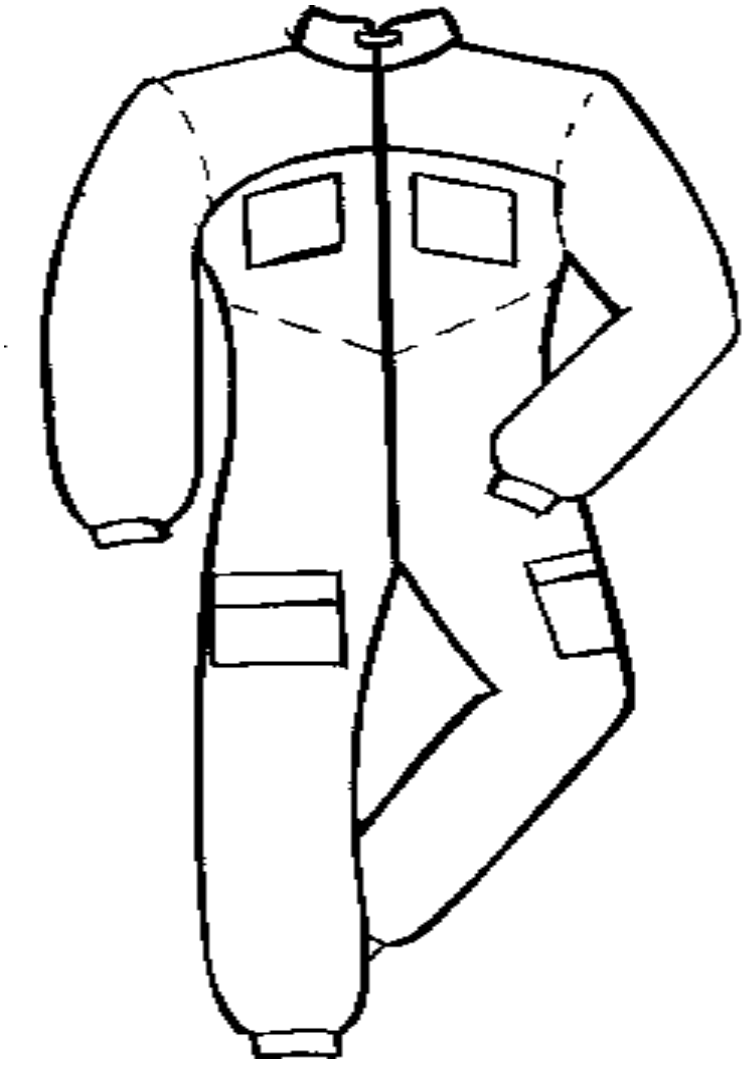
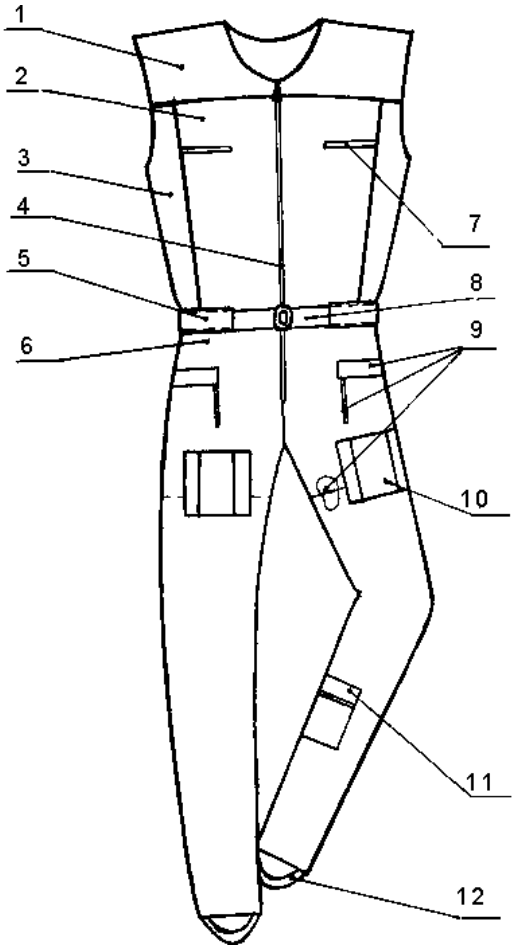


Figure 3.4 Warm coveralls

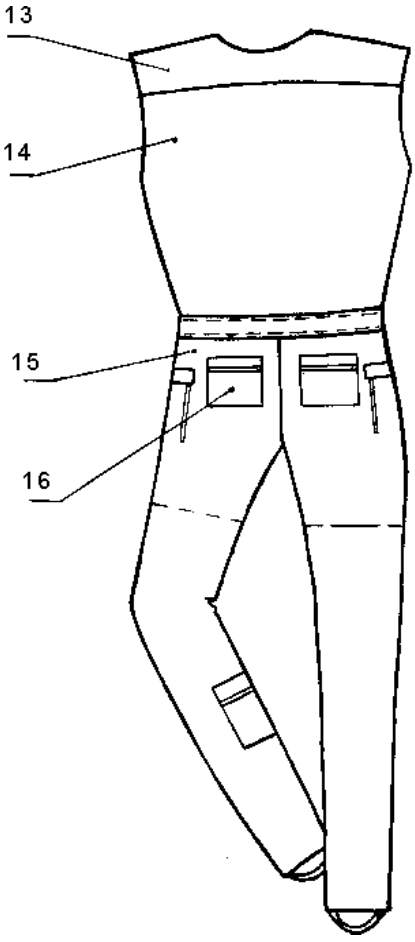
3.4. OPERATOR'S COVERALLS

Operator's coveralls maintain crewmember's comfortable body temperature under ISS ambient air temperatures in the range 20 - 30°C
Comfortable temperatures are characterized by preservation of relatively high work capability

There are patch pockets on trousers front and back thighs
Shin pocket is located on the left trouser leg shin level
There are patch pockets on trousers seat (buttocks level)



Front view



Back view

1 - front yoke
2 - front
3 - front sidebody
4 - zipper
5 - self-belt
6 - trousers front half
7 - breast pocket (internal)
8 - Braslet belt
9 - Braslet attachment device
10 - thigh pocket
11 - shin pocket
12 - foot loop
13 - back yoke
14 - back
15 - trousers back half
16 - back pocket

Figure 3.5 Operator's coveralls

3.5. SPORTS FOOTWEAR

Sports footwear (one pair) is used during physical training

Plastic bag is labeled

3.6. TOOL BELT

Tool belt is worn by crewmember when performing any maintenance or installation/deinstallation activities.

Composition:

tool belt	1 ea.
pockets and fixers from 6 to 10 (depending on configuration)	1 ea.
Bag	1 ea.

Depending on the type of activity, crewmember may use various configurations of tool belt, as well as its separate parts and components

Tool belt comes in one size and can be adjusted at the waist using provided Velcro clip

Tool belt is made from Velcro pile to which different types of multi-pockets are attached using Velcro hook

Specific design of each multi-pocket or fixer is determined by its purpose (for screwdrivers, pencils, wrenches, etc.)

3.7. SPRUT SECURING HARNESS

Sprut securing harness is used to secure crewmember in working area during perfromance of various tasks

Composition:

belt	1 ea.
short strap	1 ea.
long strap	2 ea.
stowage bag	

Harness set consists of belt, short and long straps, and stowage bag
Elastic components have the following letter codes:
Д - on the long strap
К - on the short strap

Straps are made in the shape of special-design belts (See Figure 3.7, p. 3-10), consisting of tensile and non-tensile elements, and waist belt

One of the non-tensile elements has a metal clasp with moving lock

For straps attachment, working area shall be equipped with snap hooks

Snap hook is attached to loop on the end of strap non-tensile element

Stowage bag, containing the Sprut securing harness, is made in the shape of polycaprolactam cover with Velcro fastener

Each component and separate ticket is labeled

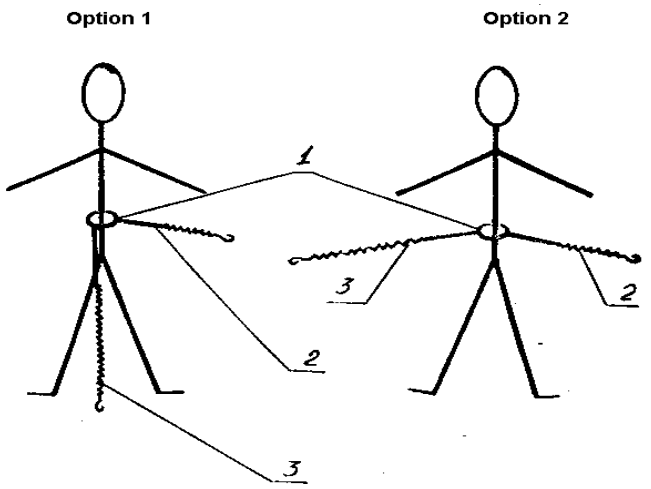


Figure 3.6. Various options to secure crewmember in the working area

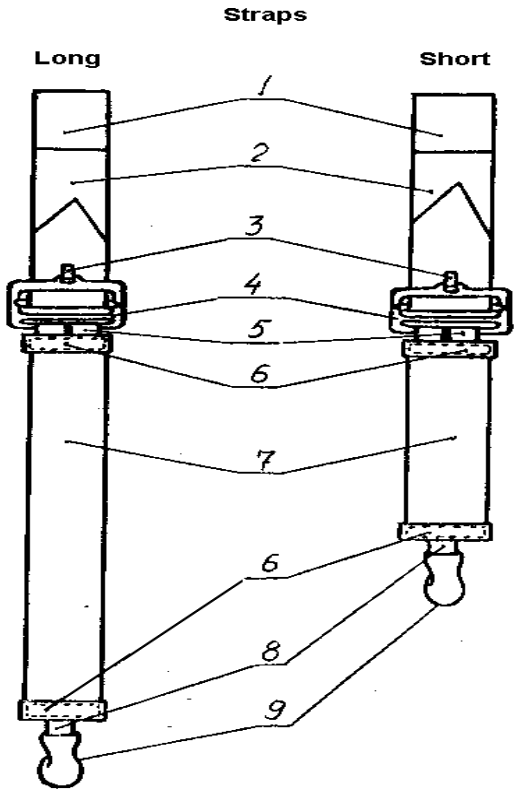


Figure 3.7 Straps

1 – tightening belt loop
2 – tightening belt
3 – loop
4 – clasp with moving lock
5 – loops
6 – non-tensile elements
7 – elastic elements
8 – loop
9 – snap hook

3.8. MOUNTER'S SET

Mounter’s set is used by crewmember when performing any maintenance or installation/deinstallation activities

Depending on type of required work, crewmember may use Mounter's set in its various configurations, as well as its separate components

Composition:

apron	1 ea.
thigh multipocket (right, left)	1 pair
arm multipocket	1 ea.
elbow sleeve	1 ea.
gloves	1 pair
wrist cuff	1 ea.
bag	1 ea.

Front part of apron has pockets, metal D-rings, detail straps, attachment loops

Mounter’s set includes right (with two pouches) and left thigh multipockets whose special design allows them to be attached onto crewmember's thighs

Mounter’s set includes arm multipocket attached to elastic cuff to be worn on crewmember's left arm

Multipocket is used for temp stowage of various small items and tools required during IFM maintenance activities

Elbow sleeve made from elastic stockinet protects crewmember's working arm from possible skin abrasions or lesions when performing IFM activities in narrow spaces

Elbow sleeve together with wrist cuff provide for hand and arm protection from any neuromuscular strains possible during IFM work

Elbow sleeve should be worn on working arm providing comfortable compression sensation; after donning elbow sleeve, wrist cuff is put on and adjusted to provide similar sensation in wrist area

All Mounter’s set parts are individually labeled

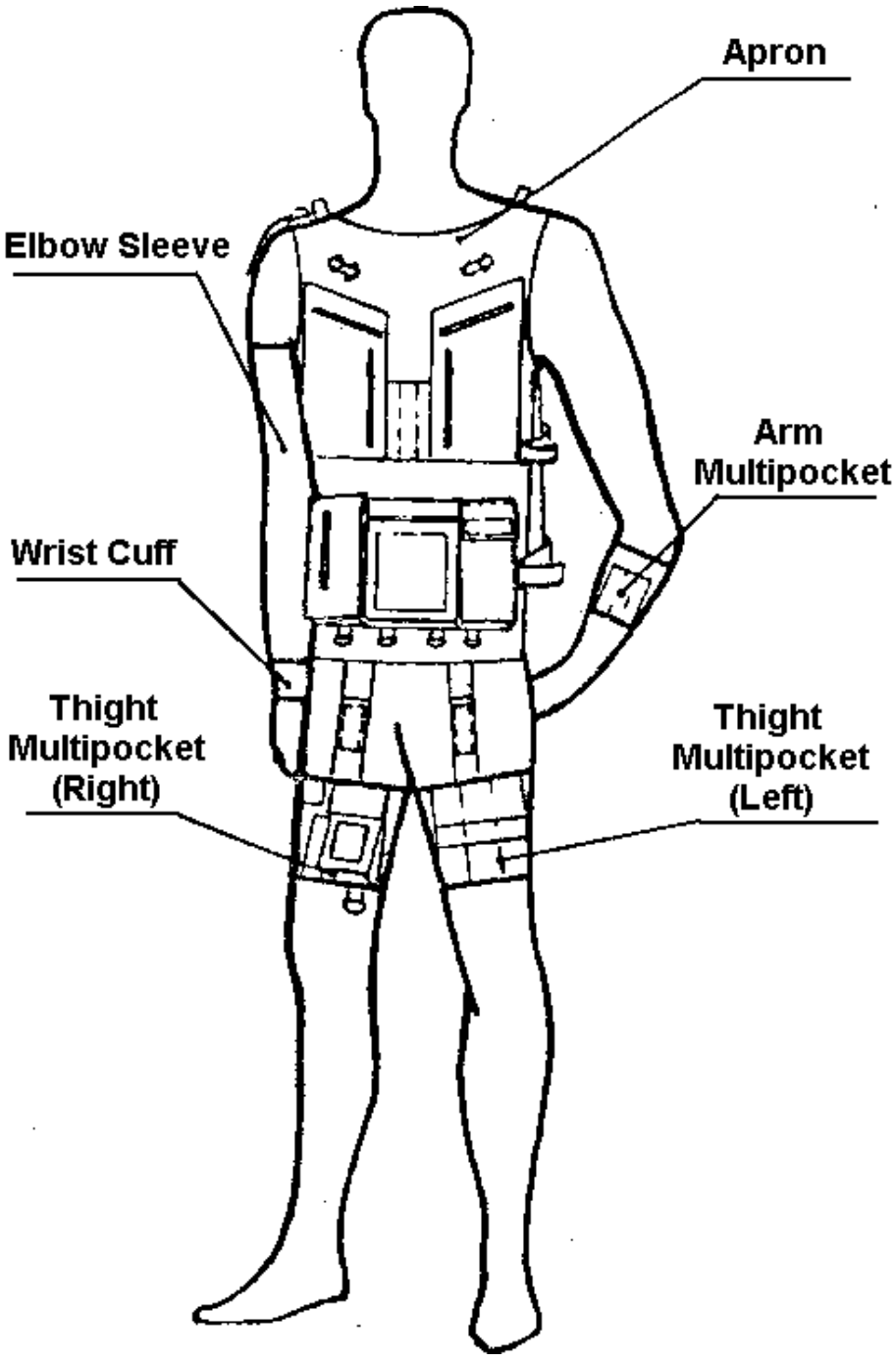


Figure 3.8 Mounter's set

3.9. COMFORT PERSONAL HYGIENE SET

NOTE

Comfort-1M set is made up with account of crewmember's personal features

Comfort-1M set contents (for individual use)**:**

Massage brush
Hairbrush
Safety razor (or razor system)
Razor blades (or set of cartridges)
Shaving cream
After-shave cream (or gel, jelly and balm)
Toothpaste
Tooth brush
Toothpicks (or dental floss)
Scissors
Cuticle tongs
Nail file
Powder
Hygienic lipstick (or balm for lips)
Cosmetic cream
Cream for hands (gel or balm)
Deodorant

Comfort-3 set contents (for replenishment of Comfort-1M set):

Massage brush
Hairbrush
Safety razor
Razor blades or cartridges
Shaving cream
After-shave cream
Toothpaste
Tooth brush
Toothpicks
Scissors
Cuticle tongs
Nail file

For brushing teeth, use toothpaste and Oral Cavity Hygiene kit

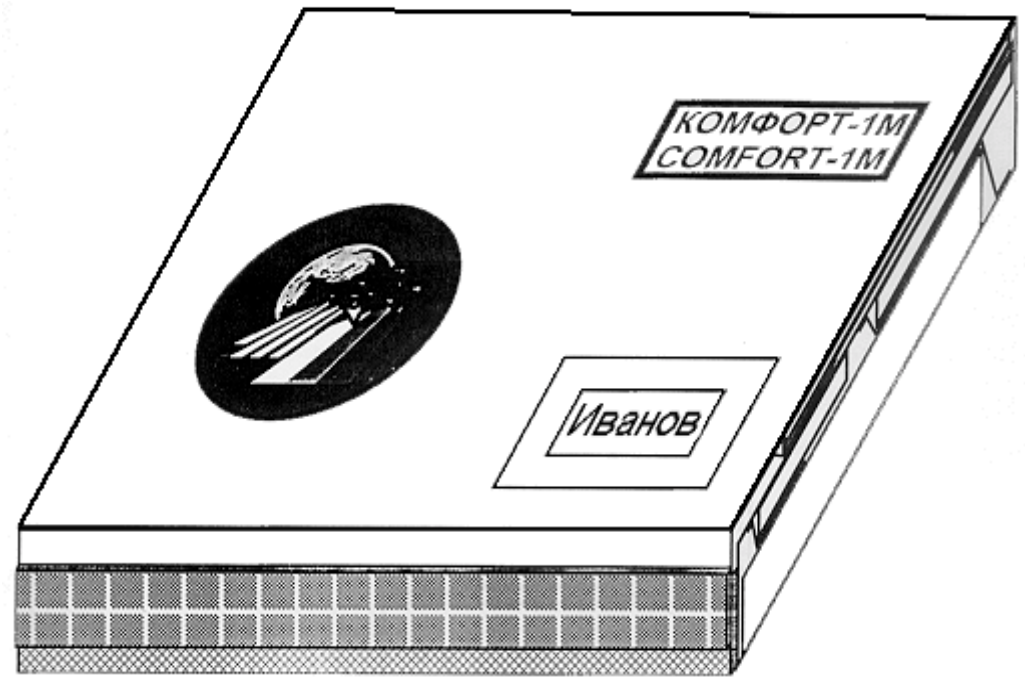


Figure 3.9 General View of Comfort-1M Personal Hygiene Set

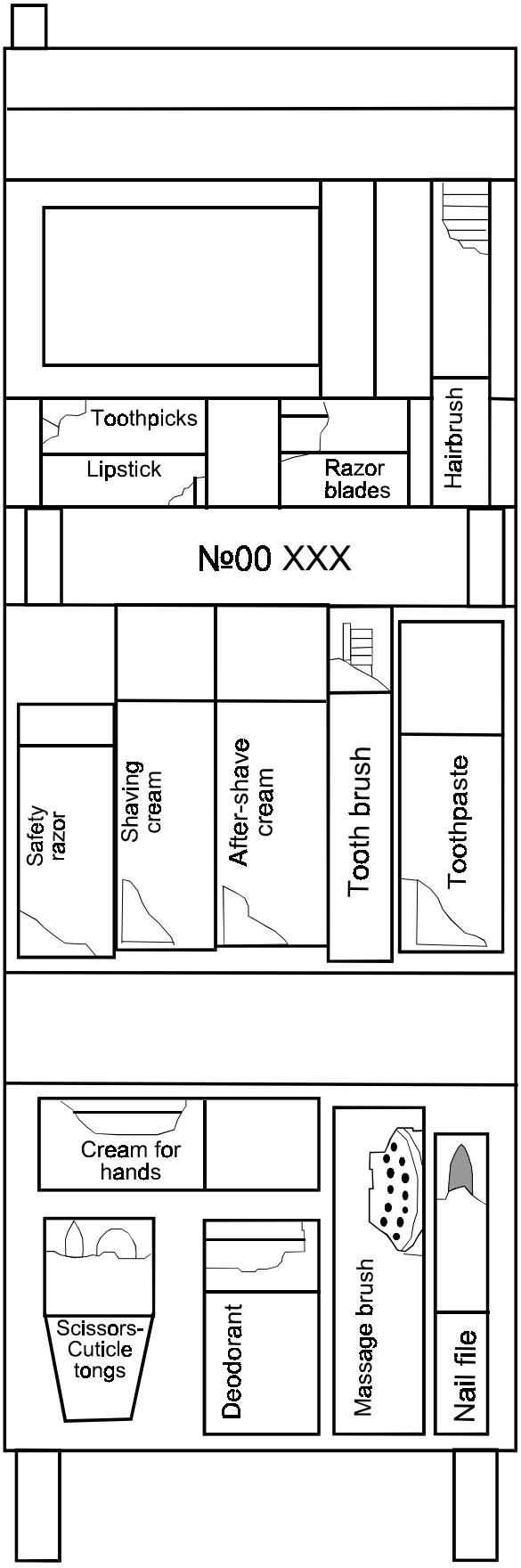


Figure 3.10 Open View of Comfort-1M Personal Hygiene Set

3.10. AELITA HYGIENE SET

Purpose:

Aelita set is used for hair care

Contents of Aelita hygiene set:

Aelita-*И* set (suffices for 3-4 uses)	4 ea.
Aelita-*И* (shampoo)	1 bottle
Paper tissues (vacuum-packed)	4 ea.
Plastic bags	4 ea.
Usage information, description — inside cover	

3.11. PERSONAL HYGIENE ARTICLES

Personal Hygiene Articles Kit

Wet tissues for morning hygiene procedures and for daytime use (for the face, neck, hands and legs) and for treatment of personal hygiene items (3 packages per 2 days for each crewmember)

Personal Hygiene Articles Kit - З

Wet towels for hygiene after physical exercise and during change of underwear (1 towel per 3 days for each crewmember)

Personal Hygiene Articles Kit - Д

Dry towels (bath towels) for hygiene after physical exercise (1 towel per 3 days for each crewmember)

Personal Hygiene Articles Kit - Д

Dry towels (made of lint-free fabric) for hygiene after physical exercise and after wet towel use (1 towel per 3 days for each crewmember)

Personal Hygiene Articles Kit - Д

Wipes for meal utensils for treatment of meal utensils (1 package per day for each crewmember)

Personal Hygiene Articles Kit - Д

Cap-shaped wipes for oral cavity (2 cap-shaped wipes per day for one crewmember if necessary)

Personal Hygiene Articles Kit - Д

Dry wipes (1 package per day for each crewmember)

Medical Chewing Gum Kit

Sugar-free chewing gum in sticks (consumption - 3 sticks per day after each meal. Chewing time – 5 min)

3.12. BERUSHI KIT

(fluffy earplugs)

Berushi kit 60 ea.

Berushi kit is intended to protect crewmember from excessive noise inside ISS (as necessary). One kit suffices for one mission

3.13. EYE MASK

Eye mask is used to protect crewmember's eyes from light during sleep or rest
It is made from elastic stockinet with sewn-in light-tight strip

Eye mask comes in one size and can be individually adjusted using Velcro clip

Each crewmember is provided with 4 masks for 2 months (i.e. one mask for every 2 weeks)

3.14. SLEEPING BAG

Sleeping bag set:

Heat-insulated bag
Insert for sleeping bag
Securing tapes and cords

After sleep, turn sleeping bag inside out and air it for 2-3 hrs

Change inserts every 20-30 days

3.15. MORPHEUS STRAPPING SYSTEM

Morpheus strapping system is intended to simulate gravity for sleeping crewmember

Composition:

Strap – pectoral	1 ea.
Strap – femoral	1 ea.
Strap – sural	1 ea.
plastic bag	1 ea.

Strap applied pressure on human body - 1-8 kgf

Straps are specially designed belts, consisting of both tensile and non-tensile elements

Tensile elements are made from highly-resilient stockinet fabric
For conveniency sake, middle parts of femoral and pectoral straps are equipped with clasps

Both ends of straps have attached tape, allowing to secure them using clamps located near sleeping bag area

Tape allows to adjust strap length, providing for pleasant body sensations and eliminating any possible discomfort, while creating sufficient gravity similation.

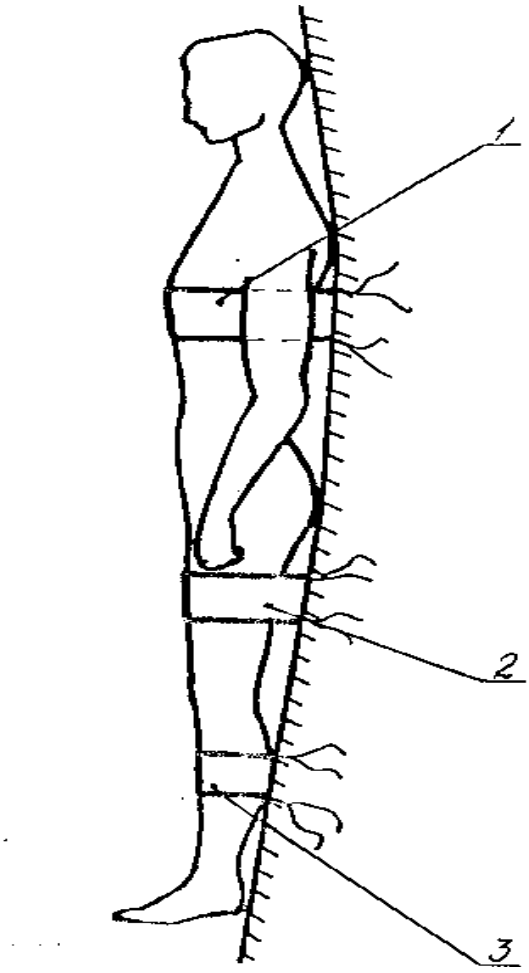


Figure 3.11 Morpheus Strapping System

1 - pectoral strap
2 - femoral strap
3 - sural strap

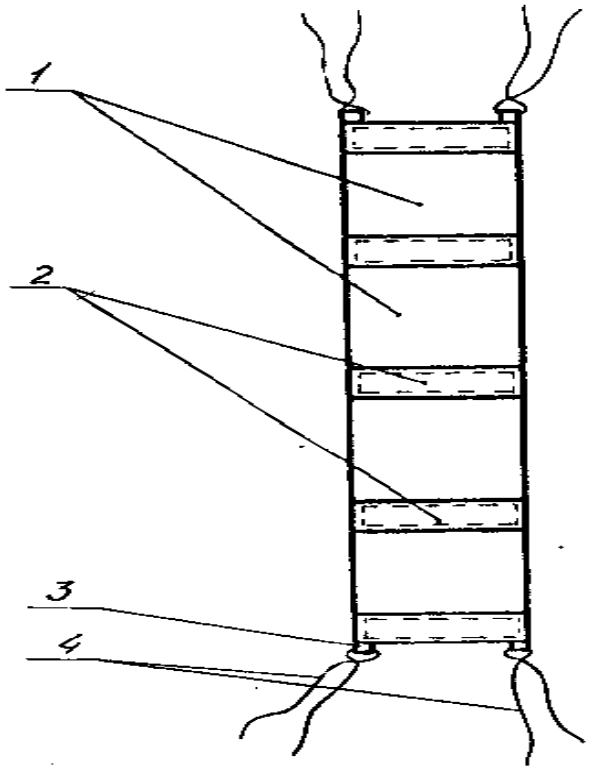


Figure 3.12 Strap Composition

1 - tensile elements
2 - non-tensile elements
3 - loops
4 - tape

For notes

4. RUSSIAN MEDICATIONS AND MEDICAL SUPPLIES

Purpose:

Medications and medical remedies are used for medical aid (self- and mutual assistance) and to provide countermeasures for crewmember's functional disorders.

Medical Kits List:

1. Medical kit with psychotropics (ПТ)
2. Medical kit with anti-inflammatory medications and supplies (ПВ-1)
3. Medical kit with anti-inflammatory medications and supplies (ПВ-2)
4. Medical kit with anti-inflammatory medications and supplies (ПВ-3)
5. Medical kit with anti-inflammatory medications and supplies (ПВ-4)
6. Medical kit with vitamins, prophylactic medications and supplies (П-1)
7. Medical kit with vitamins, prophylactic medications and supplies (П-2)
8. Medical kit with vitamins, prophylactic medications and supplies (П-3)
9. First-aid kit (НП-2)
10. First-aid kit (НП-Л)
11. Medical kit with dressings (ПС)
12. Medical kit with antipyretics and anti-trauma medications and supplies (ПОТ)
13. Medical kit with gastroenteric and urologic medications (ЖКУ)
14. Kit with splints
15. Medical kit with antiseptic medications (АС)
16. Medical kit with cardiac remedies and supplies (СС)
17. АСПРО (aspirin)
18. First-aid kit

Each Medical kit includes:

Case, containing Medical kit items
Medications and supplies in original packaging
Instruction for medications and supplies

Location area – Medical locker, containers 2, 8, 9

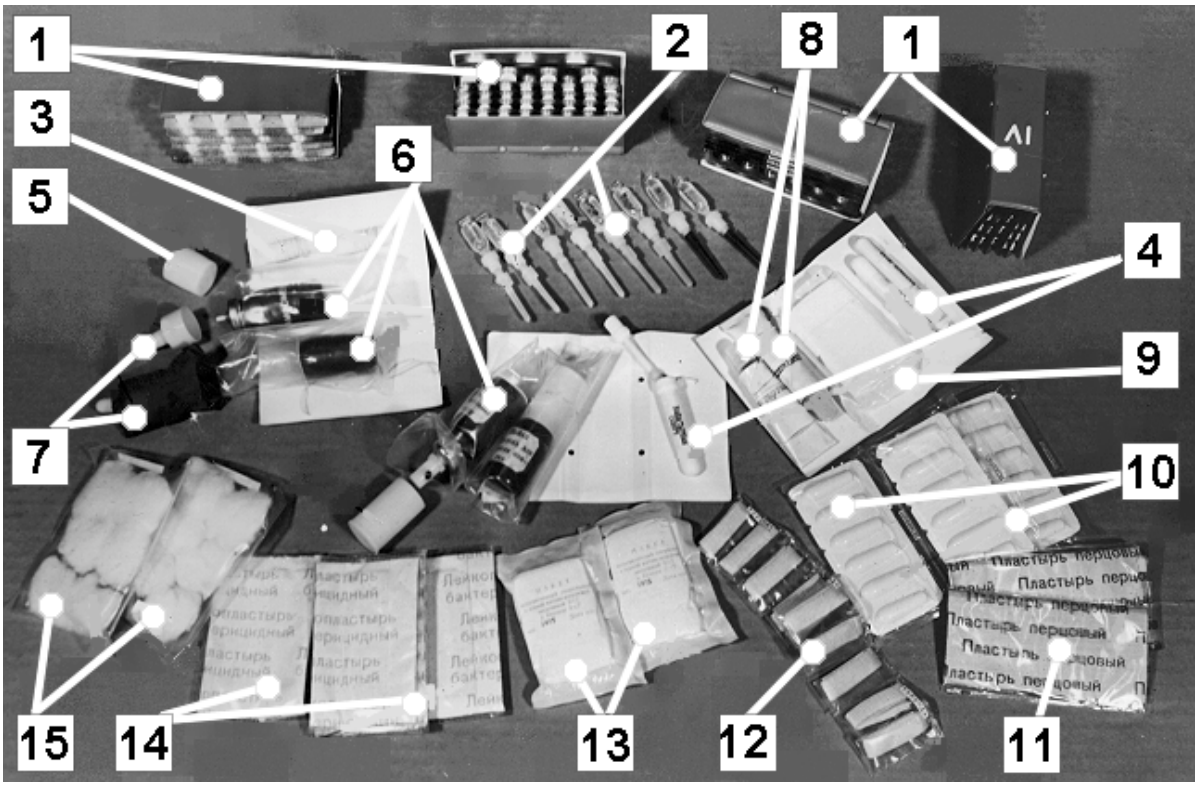


Figure 4.1 Russian Medications and Supplies

1 - “books” with tablets in Servak packaging
2 - syringe-tube with injectable medication
3 - dropper tube with eye drops
4 - tubes with swabs, saturated with liquid medication
5 - aerosol canister caps
6 - medical aid aerosol canisters
7 - aerosol canister nozzles
8 - ointment tubes
9 - vacuum-packed gauze
10 - vacuum-packed Cefecon suppositories
11 - capsicum bandage
12 - cotton turunda in vacuum packing
13 - dressing packages
14 - bactericidal bandage
15 - cotton balls in vacuum packing

GENERAL USAGE INSTRUCTIONS

Unstow Medical kit

Open and remove required remedy

Use it in accordance with instruction from Medical Kit Usage Manual and Operator Procedures for Self-care and Mutual Medical Assistance

For situation, not identified in Medical Kit Usage Manual and Operator Procedures for Self-care and Mutual Medical Assistance, √ **MCC**

If medical remedy was used — **report to MCC**

Use scissors to cut packaging, unpack remedies from packaging and cut gauze

Prior to using Medical kit remedies — clean hands with wet tissue from Personal hygiene kit

If items from Servak packages (blister package) are used — do not unscrew binding screws from 'book'
Remove items by pushing them through the foil with fingers

Use all tablets, except Validol and trinitrolong sticks, with one-two swallows of potable water. Validol — dissolve under the tongue, and trinitrolong — dissolve between gums.

Discard removed, but unused tablets, capsules, and sticks

Discard used or unwrapped syringe-tubes, making sure protective cover is placed on syringe-tube needle

For unpacked and used tubes with liquid medication — screw on cap and replace tube in pallet of Servak packaging and then in Medical kit

Use mutual assistance to apply ointment or dressings whenever possible

4.1. SYRINGE TUBE

1. Unstow Medical kit - СС, ЖКУ or НП-2
   Unpack syringe tube from Medical kit - СС, ЖКУ or НП-2

2. Turn ribbed knob ↷ (to puncture drug container)

3. Return knob to initial position
   Turn again ↷

4. Rub injection site with alcohol

5. Remove needle cap
   Jab needle into the soft tissue of thigh or upper arm

6. Inject medication
   Remove needle

7. Discard syringe-tube and needle cap into sharps container

8. Stow Medical kit

4.2. CAMETHON AEROSOL CANISTER

(for respiratory infections)

1. Unstow from Medical kit ПВ-2: Camethon aerosol canister and inhaler

2. Cut open the packaging using scissors
   Unpack canister
   Remove protective cap
   Attach inhaler to canister

3. Insert inhaler end into the mouth
   While inhaling, depress inhaler ring and hold depressed for 1-1.5 sec

4. Remove inhaler from canister
   Wipe off inhaler with wipe from Personal Hygiene Kit

5. Recap canister
   Put canister and inhaler into Medical kit
   Stow Medical kit

6. Discard used wipe

4.3. GALAZOLIN NASAL DROPS

1. Unstow 'book' with Galazolin bottle from Medical kit ПВ-2
2. Take bottle from holder
3. Unscrew and remove cap from the bottle
4. Cut off the end of bottle dropper
   Discard it
5. Apply 2 drops into each nostril
6. Screw cap on the bottle (to the hard stop)
   Secure bottle in holder
7. Stow Medical kit

4.4. DROPPER TUBE WITH EYE DROPS

1. Unstow package with eye dropper tubes from Medical kit ПОТ, ПВ-2
   Unpack one dropper tube from the pallet
2. Turn knob of the dropper tube cap ↷ (allowing solution to flow into dropper)
3. Unscrew and remove cap
4. Pull lower eyelid aside and squeeze out 1-2 drops on it
5. Recap dropper tube
   Put dropper tube into packaging, then replace into Medical kit
6. Stow Medical kit

4.5. CEFECON SUPPOSITORIES

NOTE

Store suppositories at ambient temperature under 20 - 25ºC

1. Unstow package with suppositories from Medical kit ПВ-2
2. Cut open the packaging using scissors from Medical kit НП-2, АСПРО, or First-Aid
3. Cut and open packaging of one suppository
4. Insert suppository into the rectum
5. Stow unused suppositories into Medical kit
6. Stow Medical kit

4.6. OLASOL AEROSOL SPRAY

(in case burn)

1. Unstow canister from Medical kit ПОТ
2. Cut open the packaging, using scissors from Medical Kit НП-2, АСПРО, or First-Aid
   Take out Olasol spray canister
   Remove protective cap
   Attach nozzle to the canister
3. Spray burned surface for 0.5-1 sec from a distance of 10-15 cm
4. Detach nozzle from canister
   Wipe off, using a clean gauze from Medical kit ПС
5. Recap spray canister
   Stow in Medical kit
6. Stow Medical kit

4.7. TUBE WITH AQUA AMMONIA

(in case of loss of consciousness)

1. Unstow tube with aqua ammonia from Medical kit CC
2. Unscrew cap with attached swabstick pre-moistened in aqua ammonia
3. Place swabstick to patient's nose and hold there until patient regains consciousness
4. Screw cap with attached swabstick to tube housing
5. Return tube into kit
6. Stow Medical kit

4.8. TREATMENT OF SMALL SKIN WOUNDS

(abrasions, scratches)

1. Remove from Medical Kit AC the tube with one of the following:
   iodine solution labeled "Й"
   alcohol (ethanol) labeled "С"
   Brilliant Green (skin antiseptic) solution labeled "3"
2. Unscrew cap with attached cotton swabstick pre-moistened with medication
3. Swab affected area
4. Screw cap with attached swabstick to tube housing
5. Replace tube back into Medical kit
6. Unpack bactericidal bandage from Medical kit ПС
7. Cut open the packaging containing bandage using scissors from Medical kit АСПРО, НП-2, or First-Aid
8. Unstow bandage from the package (if needed, cut a strip of the required size)
9. Remove protective film from the bandage

10. Apply the gauze side of bandage onto affected area
    Press the sides of the bandage to the skin

11. Stow unused bandage into package and replace in Medical kit

12. Stow Medical kit

4.9. TUBE WITH OINTMENT

1. Unstow and cut open the packaging containing gauze or tissue using scissors from Medical kit АСПРО, НП-2, or First-Aid

2. Cut a piece of gauze or tissue approximately 2-3 times lager than the affected area

3. Remove tube with ointment from the package (breaking sealant foil in the tube nozzle, if necessary)

4. Squeeze an adequte amount of ointment onto gauze or tissue

5. Close tube
   Replace tube into Medical kit

6. Evenly distribute ointment over gauze or tissue using the flat tipped plastic stick from either First Aid kit or from Medical kit

7. Place gauze onto affected area
   Securing it by 3-4 layers of gauze on the top
   Cut and tie (elastic bandaging can be used)

8. Wipe the flat tipped plastic stick clean

9. Stow scissors and flat tipped plastic stick

10. Stow First-Aid Kit and Medical kit

11. Discard leftovers of gauze and packaging

4.10. CAPSICUM BANDAGE

1. Unstow package with bandage from Medical kit ПВ-2
   Cut open the packaging using scissors from Medical kit АСПРО, НП-2, or First-Aid

2. Cut a piece of bandage (sized to overlap the affected area)

3. Remove protective film
   Apply working side with capsicum onto the affected area

4. Stow unused bandage into packaging and replace in Medical kit

5. Stow Medical kit

4.11. DRESSING PACKAGE, COTTON BALLS AND GAUZE

1. Unstow appropriate package from Medical kit ПС
   Cut open the packaging using scissors from Medical kit АСПРО, НП-2, or First-Aid

2. Use as required

3. Discard:
   leftovers of gauze
   packaging
   used cotton balls

4. Stow Medical kit

4.12. IMMOBILIZATION SPLINTS

1. Unstow splints from the Kit
   Unstow and cut open a gauze package

2. Splint limb
   Secure the splint with gauze

3. Stow unused splints and gauze in Medical kit
   Stow Medical kit

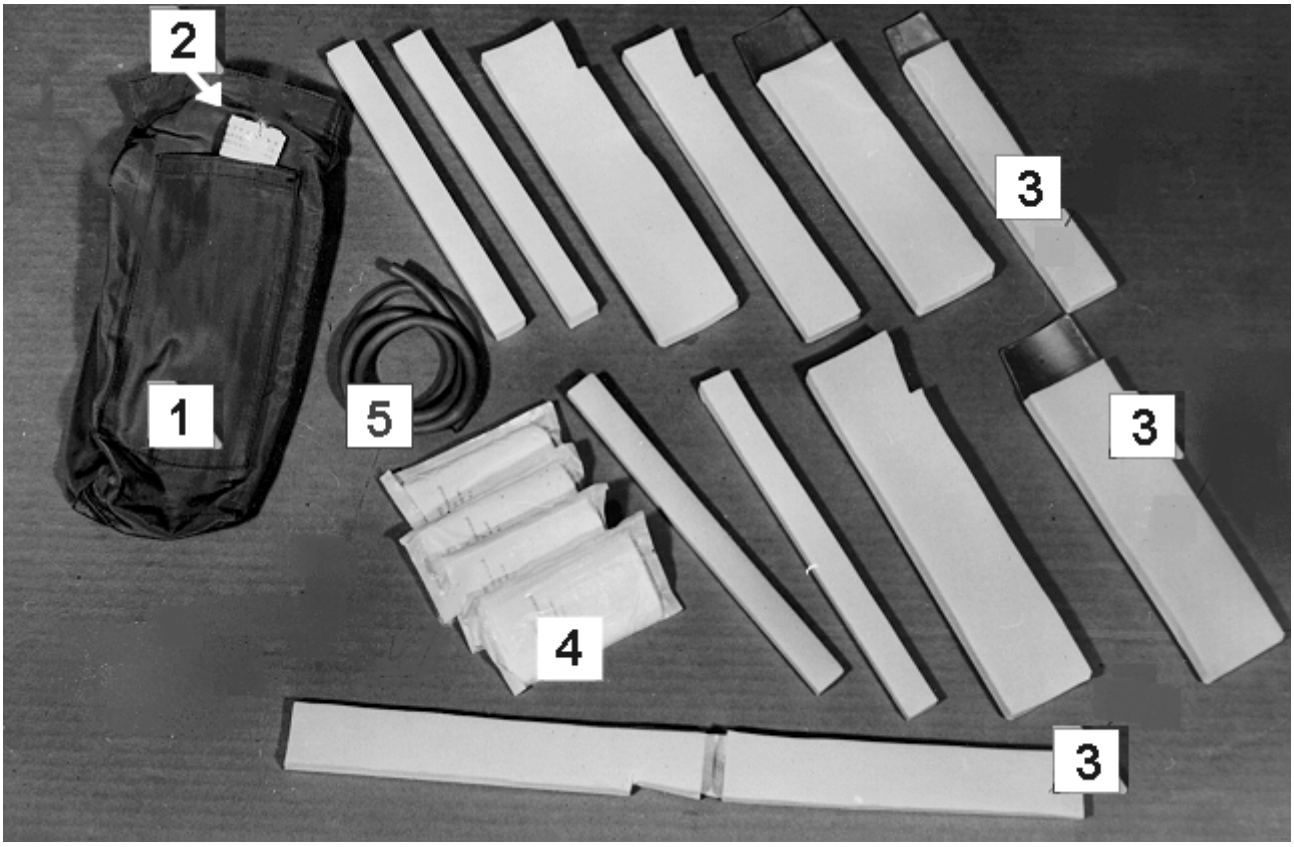


Fig. 4.2 Splint Kit

1 - cover

2 - manual

3 - splints

4 - gauze dressings

5 - tourniquet (silicone or rubber tube)

4.13. STOPPING MAJOR BLEEDING IN EXTREMITIES

CAUTION
Do not apply tourniquet for more than 2 hours

1. Unstow tourniquet (rubber or silicone tube) from Splint kit

2. Apply tourniquet above bleeding site
   Tie tube ends
   Record time of tourniquet application
   (loosen tourniquet after 2 hours)

3. Replace tourniquet into the kit after having stopped the bleeding

4. Stow Medical kit

4.14. АСПРО (WATER SOLUBLE ASPIRIN)

1. Remove package containing water soluble aspirin from Medical kit АСПРО

2. Add (approximately 75 ml) of potable water to the package contents

3. Dissolve the package contents in water (by shaking it gently)
   Drink the aspirin solution

4. Discard used packaging

4.15. INSTRUCTIONS FOR USAGE OF FIRST-AID KIT CONTENTS

Indication	Remedy code number and name	Daily dosage	Location
Pain	3 Analginum	1X2 - 3	“book” II
	4 Aspirin	1X2 - 3	“book” II
Chest (cardiac) pain	7 Validol	1 tab. under the tongue	“book” I
	8 Nitroglycerin	1 tab. under the tongue	container #4
Impairment of cardiac rhythm	9 Panangin	1 - 2X2 - 3	“book” I
	10 Isoptin (Verapamil)	1X3	“book” II
Hypertension	11 Papazol	1X2 - 3	container #6
Fainting conditions	63 Aqua Ammonia	inhale as needed	pallet for containers
Hypotension	20 Caffeine	1X2 - 3	“book” II
Hot flushes of the head	164 Furosemid (Lasix)	1 tab. (once)	
Difficult breathing, asthma	15 Atropine	1 ea. i.m.	lid
Cough	81 Libexin (Tusuprex)	1X2 - 3	“book” I
Running nose	17 Inhacamf	inhale	container #1
Emotional stress	18 Phenibutum	1X2 - 3	“book” I
Fatigue	20 Caffeine	1X2 - 3	“book” II
Insomnia	22 Radedorm (Nitrazepam)	1-2 tabs. Prior to sleep	“book” II
Itching, nettle rash (urticaria), edema	47 Suprastatin	1X2 - 3	“book” II
Transport sickness, nausea, vomiting	15 Atropine	1 ea. i.m.	lid
Gastro-intestinal disorders	25 Levomycetin (Chloromycetin)	1X4	“book” II

Indication	Remedy code number and name	Daily dosage	Location
Inflammatory diseases	26 Madribon (Sulfadimethoxonum)	1X1 - 2	"book" II
	27 Oletetrinum	1X4 - 5	"book" II
Abdominal pain	28 Bellalgin	1X2 - 3	container #2
Constipation	125 Senade	1 tab. Prior to sleep	"book" II
Traumatic dermatitis, burns	64 Metyluracil ointment	Use as needed	pallet for containers
Minor traumas, eye and nose mucous membrane infections	102 Tetracycline ointment	Use as needed	pallet for containers
Skin abrasions and scratches, minor traumas	72 Bactericidal bandage	apply where needed	pallet for dressings
Various lesions	74 bandage gauze 1.5X6	apply where needed	pallet for dressings
	50 dressing package	apply where needed	
Per indication	75 scissors		pallet for "books"
	76 flat tipped plastic stick		pallet for containers

For notes

5. MEANS FOR MICROGRAVITY COUNTERMEASURES

5.1. BRASLET AND BRASLET-M UNITS

Purpose:

Braslet and Braslet-M units are countermeasure means intended for compression of proximal parts of lower extremities in order to artificially create blood afflux into these areas

Braslet and Braslet-M units should be used during acute phase of adaptation to microgravity for prevention of its adverse effect on cardiovascular system

Braslet Components:

belt	1 ea.
compression cuffs (left and right)	1 pair
stowage bag	1 ea.

Braslet-M Components:

compression cuffs (left and right)	1 pair
stowage bag	1 ea.

During operation, compression cuffs are attached to belt using pull-up straps

Belt is used to secure compression cuffs in working position on crewmember's thighs using freely moving pull-up straps (Figure 5.2 p. 5-2)

Compression cuffs Braslet and Braslet-M units in their working state create compression in upper thirds of crewmember's thighs (see Figure 5.3 p. 5-3, and Figure 5.4 p. 5-4)

This causes a part of circulating blood volume to relocate from upper body to lower extremities, which corrects the adverse hemodynamic effect of microgravity, thus improving crewmember's working capability

Compression cuff in Braslet and Braslet-M units is a combination of alternating multi-layer tensile and non-tensile elements

Elastic forces generated by distension of tensile elements create necessary pressure on body surface

Geometric shape of non-tensile elements gives to compression cuff a certain configuration that allows to position it along a skewly ascending line on the thigh's upper third providing a required tight fit

Cuff tightening on crewmember's thigh is performed using tightening strap with adjustable clasp

Tightening strap has a digital compression scale with working zones indication from “1” thru “6” (Figure 5.1) and from “1” thru “5” (Braslet-M) (Figure 5.2)

Braslet and Braslet-M units are packed into a stowage bag

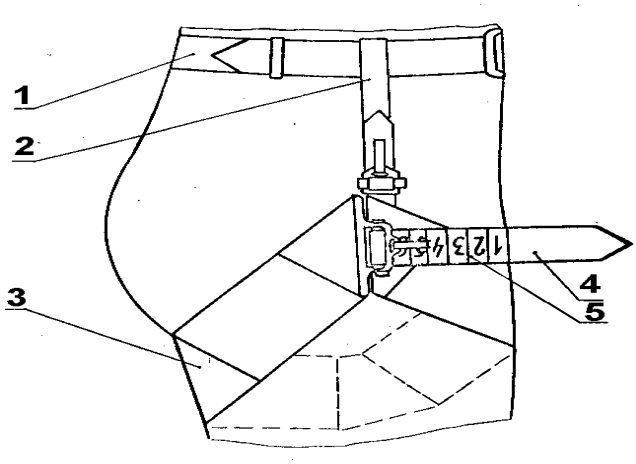


Figure 5.1 Braslet

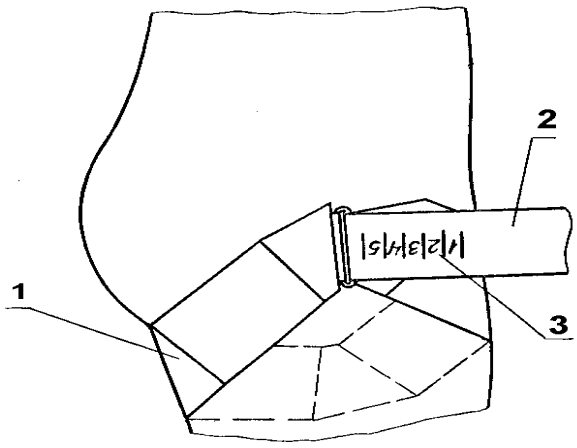
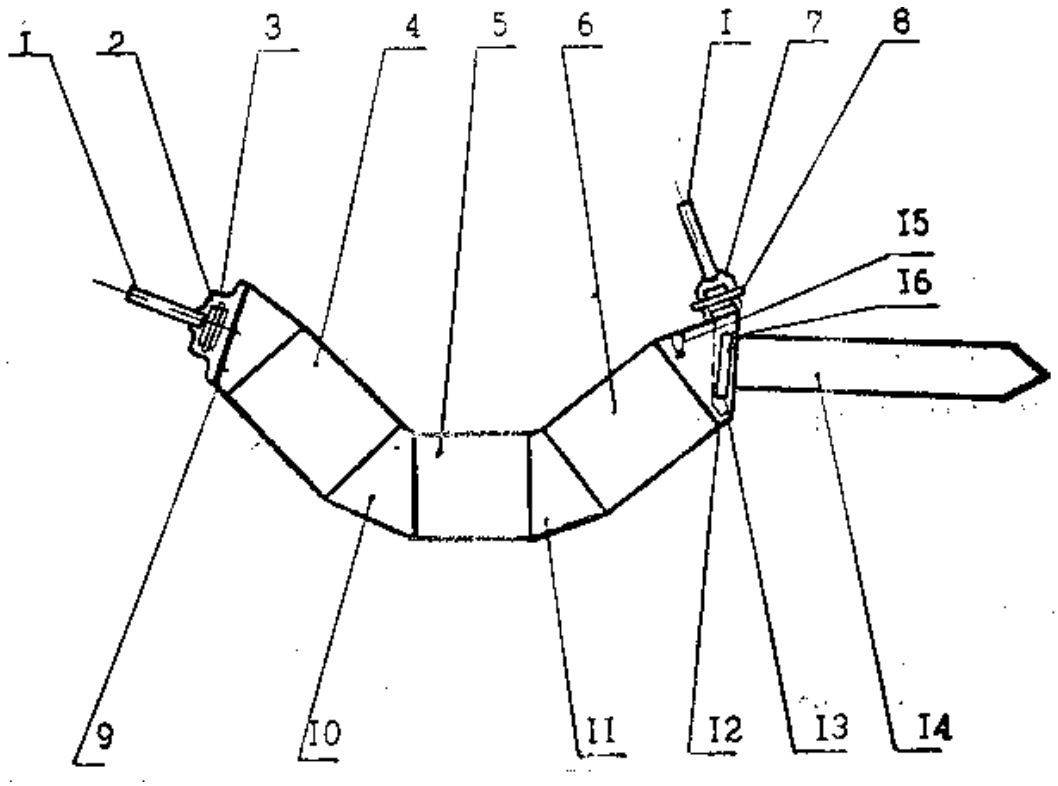


Figure 5.2 Braslet-M

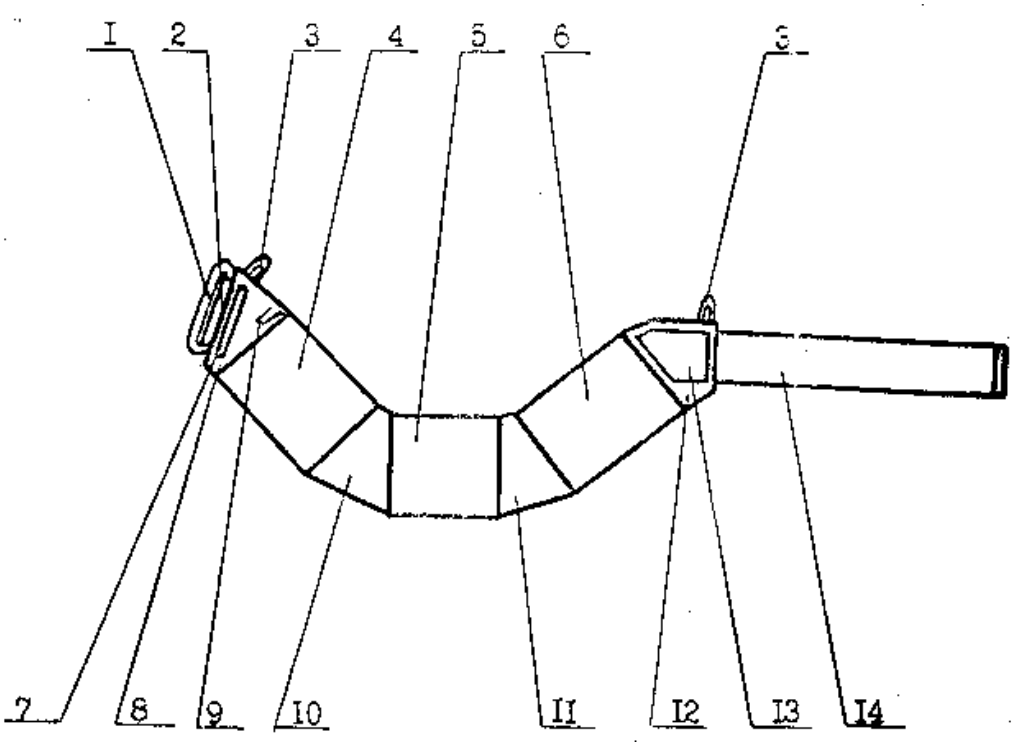
1 - belt
2 - pull-up strap
3 - compression cuff
4 - tightening strap
5 - compression scale

1 - compression cuff
2 - tightening strap
3 - compression scale



1 - loop
2 - buckle
3 - movable link
4 - posterior elastic element
5 - middle elastic element
6 - anterior elastic element
7 - buckle
8 - movable link
9 - posterior lateral non-tensile element
10 - posterior non-tensile element
11 - anterior non-tensile element
12 - lateral anterior non-tensile element
13 - bolt loop
14 - tightening strap
15 - cuff index
16 - plate

Figure 5.3 Braslet Compression Cuff



1 - clamp
2 - holder
3 - loop
4 - posterior elastic element
5 - middle elastic element
6 - anterior elastic element
7 - bolt loop
8 - posterior lateral non-tensile element
9 - cuff index
10 - posteroir non-tensile element
11 - anterior non-tensile element
12 - lateral anterior non-tensile element
13 - patch
14 - - tightening strap

Figure 5.4 Braslet-M Compression Cuff

5.2. PENGUIN-3 CONSTANT-LOADING SUIT

Purpose:

To prevent unfavorable effects of microgravity on human body during space flight
Countermeasures are provided by application of resistance loads on the musculoskeletal system and by additional loads on the skeletal muscles generated in response to body and leg movement
Penguin-3 is intended for in-flight wear

NOTE

1. To maximize Penguin-3 suit effectiveness: (i) the suit must be worn constantly, (ii) strap tension should be optimized (subjectively measured tension load should be ~15 kg), and (iii) periodic pedaling leg movements should be accomplished for 5-10 min, 6-8 times per day
2. Replace the suit after 45 days of wear

5.2.1. SUIT DONNING AND ADJUSTMENT

(See Figure 5.5 p. 5-7)

NOTE

1. If the suit has not been adjusted - adjust it per usage manual in the chest pocket or per Sect. 5.2.3 p. 5-6
2. If the belt is uncomfortable when tightened, unbuckle it
3. If there is pain sensation in the lumbar region - decrease the tension of the back tension straps and increase the tension of the chest tension straps

1. Loosen chest tension straps and back tension straps using adjustment buckles (#2, #3)
   Unzip central zipper (#25), unfasten belt adjustment buckle (#1) and horizontal chest strap (#20) buckle

2. Don lower part of the suit
   Fasten the belt buckle (#1) slightly tightening the belt (#21)

3. Don boots and close zipper
   Engage four suit trouser hooks (#31) to each boot
   Don the top part of the suit

4. Uniformly tension chest and back tension straps using adjustment buckles (#2, #3) until belt (#21) is positioned on the waistline
   Tighten the belt

5. Fasten the horizontal chest strap (#20)

6. Close central zipper (#25)

5.2.2. PREPARATION FOR PEDALING

(See Figure 5.5 p. 5-7)

1. Put stirrups (#26) on boots and secure with Velcro clip

2. Secure the stirrup strap (#19) to the stirrup strap adjustment buckle (#4)
   Adjust tension as required (choosing the highest possible load that does not cause any unpleasant or painful sensations)

5.2.3. PENGUIN SUIT ADJUSTMENT

(See Figure 5.5 p. 5-7)

1. Loosen straps by using adjustment buckles (#2 through #10)

2. Don the suit
   Tighten the belt (#21) on the waist line using belt adjustment buckle (#1)

3. Tighten adjustment straps under pants cuffs (#29, #30) using height adjustment buckles (#10) (two on each side) so that the buckle (#4) should stay below knee

4. Tighten front leg tension straps using buckles (#5) (two on each side)
   Tighten slanted back leg tension straps using adjustment buckles (#6, #9) (with orange tabs) so that adjusted angle A equals ~135 degrees

5. Tighten straight back leg tension straps using adjustment buckles (#7, #8) so that adjusted angle B equals ~135 degrees

6. Loosen belt (#21) using belt adustment buckle (#1)

> NOTE
>
> Keep all previously adjusted angles (A and B) at set values

7. Tighten chest and back straps using adjustment buckles (#2, #3) so that loosened belt (#21) will be positioned on the waistline (subjectively measured tension load on shoulders should be ~ 15 kg)

8. Fasten the horizontal chest strap (#20)

> NOTE
>
> Readjust suit as needed to increase or decrease tension load levels

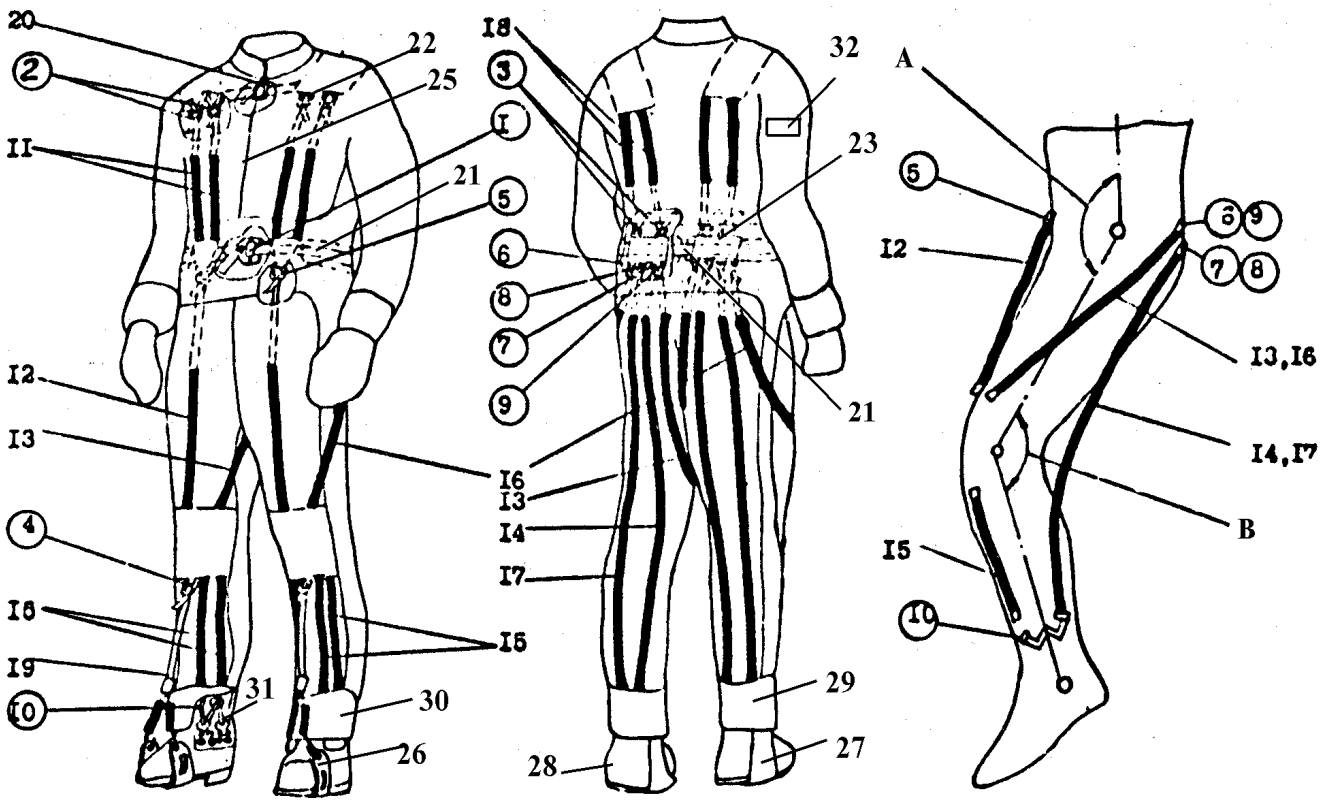


Figure 5.5

1. Belt adjustment buckle
2. Chest tension strap adjustment buckles
3. Back tension strap adjustment buckles
4. Stirrup strap adjustment buckles
5. Front leg tension strap adjustment buckles
6. Slanted outer back leg tension strap adjustment buckles
7. Straight inner back leg tension strap adjustment buckle
8. Straight outer back leg tension strap adjustment buckles
9. Slanted inner back leg tension strap adjustment buckles
10. Height adjustment buckles
11. Chest tension straps
12. Front leg tension straps
13. Slanted inner back leg tension straps
14. Straight inner back leg tension straps
15. Uniformly tensioned leg tension straps
16. Slanted outer back leg tension straps
17. Straight outer back leg tension straps
18. Back tension straps
19. Stirrup strap
20. Horizontal chest strap
21. Belt
22. Pockets for accessing buckle 2
23. Pockets for accessing buckle 3
24. Pockets for accessing buckles 6,7,8,9
25. Central zipper
26. Stirrup
27. Footstep
28. Shoes
29. Cuffs
30. Cuffs
31. Hooks for securing the suit to the boots
32. Pocket

Figure 5.6 Penguin-3 Suit

5.3. THK-U-1 TRAINING-LOADING SUIT

Purpose:

Worn during physical exercises on the treadmill

Use after fit adjustment
Individually distinguish by the color of the waistband pads

Composition:

Bag
THK-U-1Training-loading suit
Replaceable hygiene covers for shoulder pads (4 pairs) – 8 ea.

Suit Adjustment (Figure 5.7, Figure 5.8 p. 5-10):

> NOTE
>
> Marks on waistband are numbered 42 through 54, which corresponds to crewmember's chest circumference, ranging from 84 to 108 cm

1. Straighten out the suit
   Remove waistband pads (#5, #6) and unfasten Velcro on waistband from behind
   Put the left end of the waistband on the mark on the right end according to the crewmember's size and fasten

2. ◅ waistband fit:
   waistband fits snug below the waist
   extensions are positioned on the mid-thigh area

3. Join waistband pads using the mark on the pad corresponding to that on the waistband
   Place pads (#5, #6) on the waistband
   Move the shoulder straps with strap covers (#7) to a position comfortable for crewmember
   Adjust shoulder straps (#3, #4) height and secure power strap strip (#14) in the buckle
   Tighten chest pad strip (#25) on the chest
   Tighten belt strap (#12)

4. Use extensions to attach the suit to the treadmill restraint system
   Adjust length of extensions according to the marks (depending on crewmember's height)

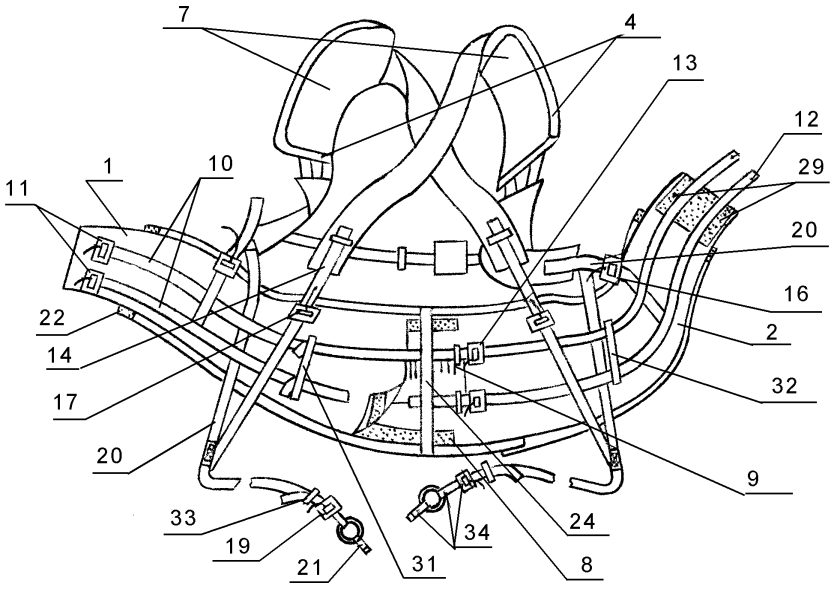


Figure 5.7 Training-Loading Suit THK-У-1 Components (Front View)

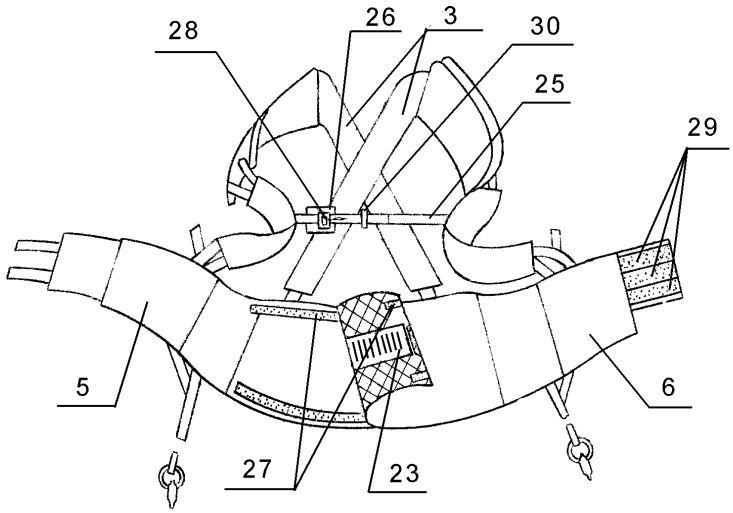


Figure 5.8 Training-Loading Suit THK-У-1 Components (Back View)

1 – waistband left side
2 – waistband right side
3 – left shoulder strap
4 – right shoulder strap
5 – right waistband pad
6 – left waistband pad
7 – shoulder strap cover
8,22,27,29 – Velcro fasteners
9,23 – marks
10 – waistband left side belt
12 – waistband right side belt
17,11,13,16,28 – buckles
14 – power strap strip
20 – leash holder
19,21 – leash buckle
24 – waistband pad holder
25 – chest pad strip
26 – chest pad
30,31,32,33 – loops
34 – leash

Figure 5.9 Training-Loading Suit ТНК-У-1 (Front View)

Figure 5.10 Training-Loading Suit ТНК-У-1 (Back View)

5.4. CYCLE ERGOMETER ВБ-3

Purpose:

Cycle ergometer ВБ-3 is designed for multi-purpose physical exercises is intended to prevent unfavorable effects of long-duration space flight and as cycle ergometer for performance of functional tests

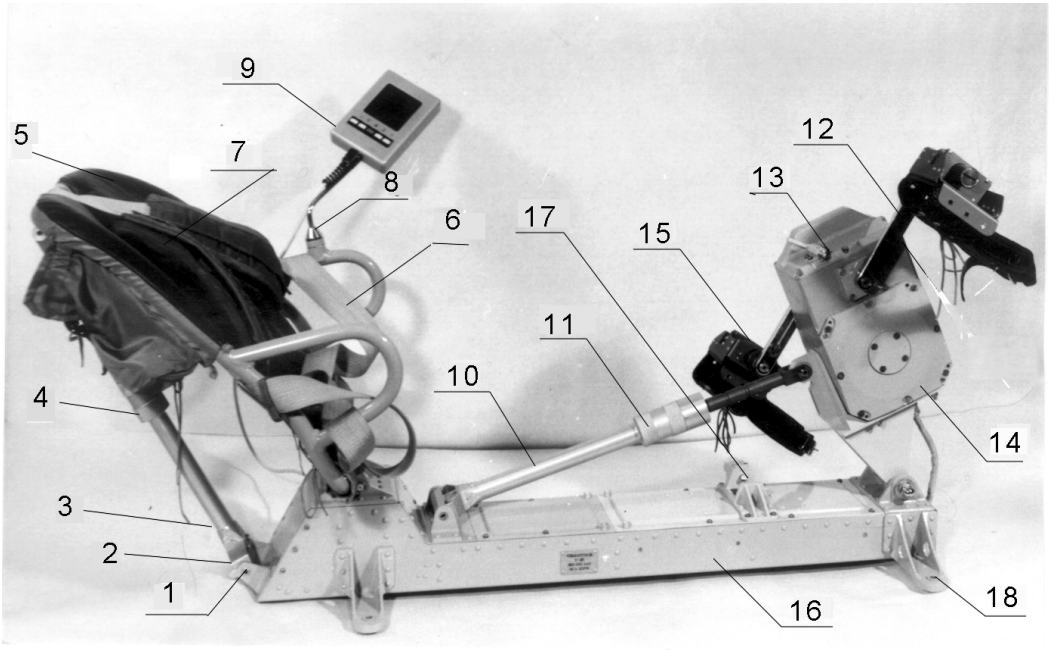


Figure 5.11 Cycle Ergometer in Working Configuration

1 -	Bracket	7 -	Seat Casing	13 -	Connecting Rod Fixer Latch
2 -	Handle	8 -	Screw	14 -	Generator Assembly
3 -	Rod	9 -	Control Panel	15 -	Toe Clips
4 -	Sleeve	10 -	Rod	16 -	Frame
5 -	Seat	11-	Sleeve	17 -	Fixer Latch
6 -	Belt	12 -	Connecting Rod	18 -	Bracket

Pedal shaft power is set discretely from ergometer control panel:
XX (idle mode), 100, 125, 150, 175, 200, 225, 250 W and is maintained constant within a range of 40-80 rpm

Available modes are: XX (idle mode), active pedaling (under load) mode, free movement mode

For idle mode (xx) pedal power is no more than 50 W

When pedaling at a speed higher than 80 rpm there is a sharp increase in a load on the pedals

During free movement mode -- there is no load on pedal shaft and pedals are rotated in direction opposite to that in XX (idle) and active pedaling modes.

Generator assembly and seat are attached to the frame using telescopic rods, allowing their adjustment for crewmember's convenience

Cycle Ergometer design allows to adjust seat angle within 0 - 70° range (relative to horizontal frame), with six set positions possible, as well as provides for generator assembly movemenent up to 300 mm along horizontal axis with seven set positions possible.

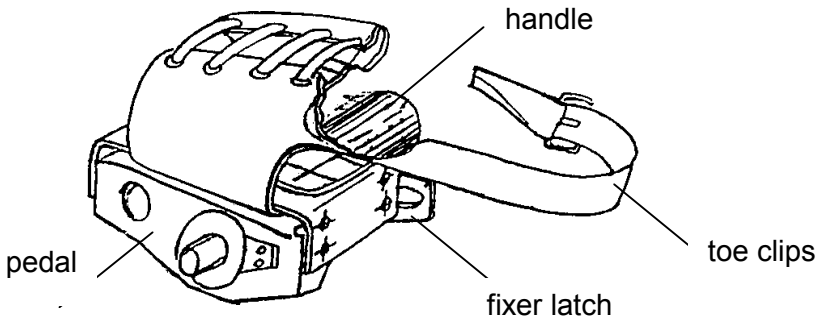


Figure 5.12 Standardized Pedal

Pedal is used for foot or hand pedaling. During foot pedaling, pedal is secured on handle via spring fixer latch. During hand pedaling, pedal is removed from handle and stored in seat casing pocket.

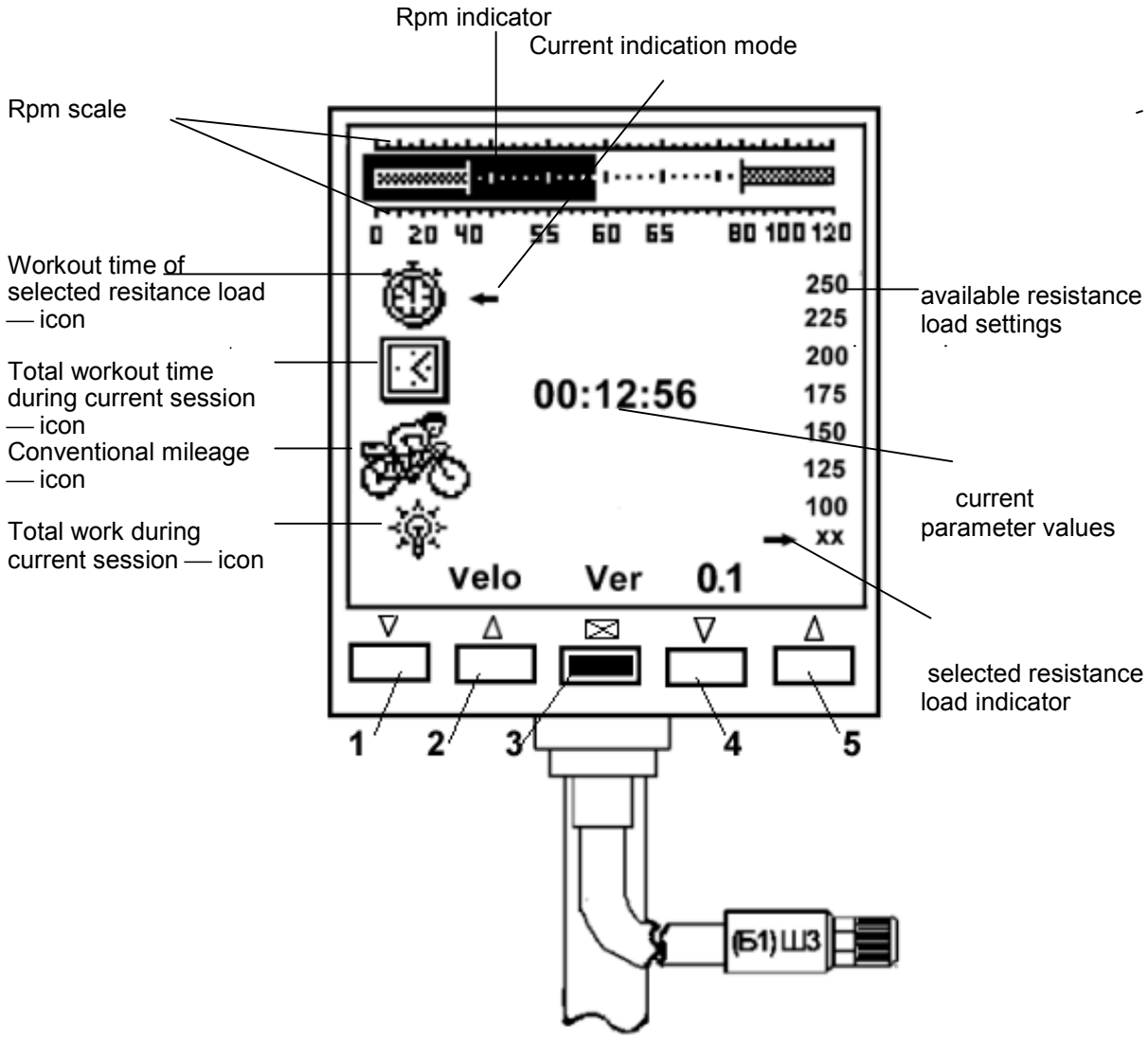


Figure 5.13 Cycle Ergometer Control Panel

Control Panel Controls and Its Display Messages (see Figure 5.13 p. 5-13):

Indicator — Displays the following parameters (only during pedaling, since the indicaton is generator-powered):
- Pedal shaft rotation speed
- Selected resistance load (in Watts)
- Total workout time during current session
- Workout time of selected resistance load
- Total work during current session
- Conventional mileage
- Current indication mode

Buttons Δ, ∇ (1, 2) — Scroll through parameters

Button **[X]** (3) — To reset the following parameters:
- Total workout time during current session
- Workout time of selected resistance load
- Total work during current session
- Conventional mileage

Buttons Δ, ∇ (4, 5) — Scroll through available resistance load settings

Rpm indicator scale range — 0---120 rpm

Scale factor in sub-ranges:

0---50 rpm sub-range	5 rpm
50---70 rpm sub-range	1 rpm
70---120 rpm sub-range	5 rpm

Parameter icons - to display various parameters

Currently active indication mode is highlighted with arrow ⬅, to the right of highlighted (active) icon.

Inidication mode selection is done using buttons Δ and ∇ (1, 2) (to the left of Cycle Ergometer Control Panel)

Depending on selected mode the following digital data are displayed in the center of readout:
- workout time of selected resistance load
- total workout time during current session
- conventional mileage
- total work during current session

Workload setting icons show all available workload settings

Currently active workload setting is highlighted with arrow sign ➡, to the left of the highlighted (active) icon

Workload setting is selected using buttons Δ and ∇ (4, 5) (to the right of Cycle Ergometer Control Panel)

Cycle ergometer ВБ-3 location: pnl 121

5.4.1. CYCLE ERGOMETER INITIAL SETUP

(Figure 5.11 p. 5-12)

OPTION 1

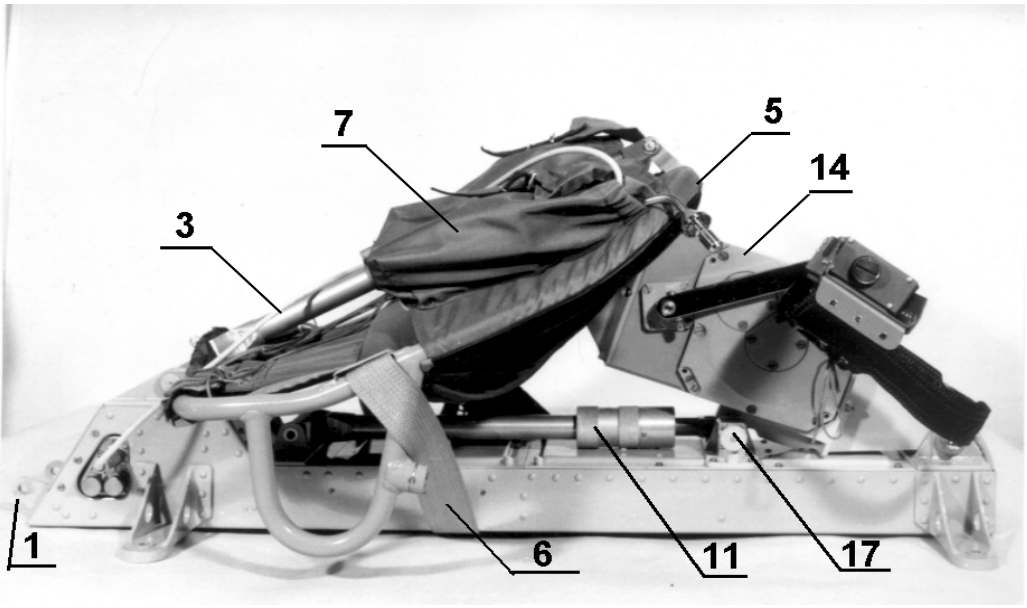


Figure 5.14 Cycle Ergometer in Configuration for Storage under panel 121 (Option 1)

1. Arrange panel 121 into Cycle Ergometer usage position

2. Remove belt (#6) from right connecting rod and unfasten belt buckle
   Release the detachable end of seat rod by removing elastic hold-down from handles on the fixer latch of the rod end

3. ↓ the handles (#2) of the rod securing assembly
   Align the fixer latch fingers with the bracket alighnment hole (#1) and release handles
   Lift seat vertically
   Secure disconnected end of seat rod (#3) in frame bracket (#1)

4. Arrange seat (#5) into working configuration, by pulling seat rod sleeve (#4) in the arrow direction
   Secure seat and release sleeve

5. Remove control panel from the seat casing (#7) pocket
   Arrange control panel into working configuration in seat's handrail

6. Detach generator assembly (#14) by pulling aside the fixer latch (#17) button
   Lift the generator assembly until first fixed position is reached

7. Arrange generator assembly into working configuration by pulling sleeve (#11) in the arrow direction and secure generator assembly by releasing sleeve

8. Unlock connecting rod (#12) of pedal gear shaft from transport configuration:
   Pull out fixer latch (#13) handle and turn it in the arrow direction to OPEN position (see Figure 5.15 p. 5-16)
   ◅ Handle pin should enter the short chase on the latch body

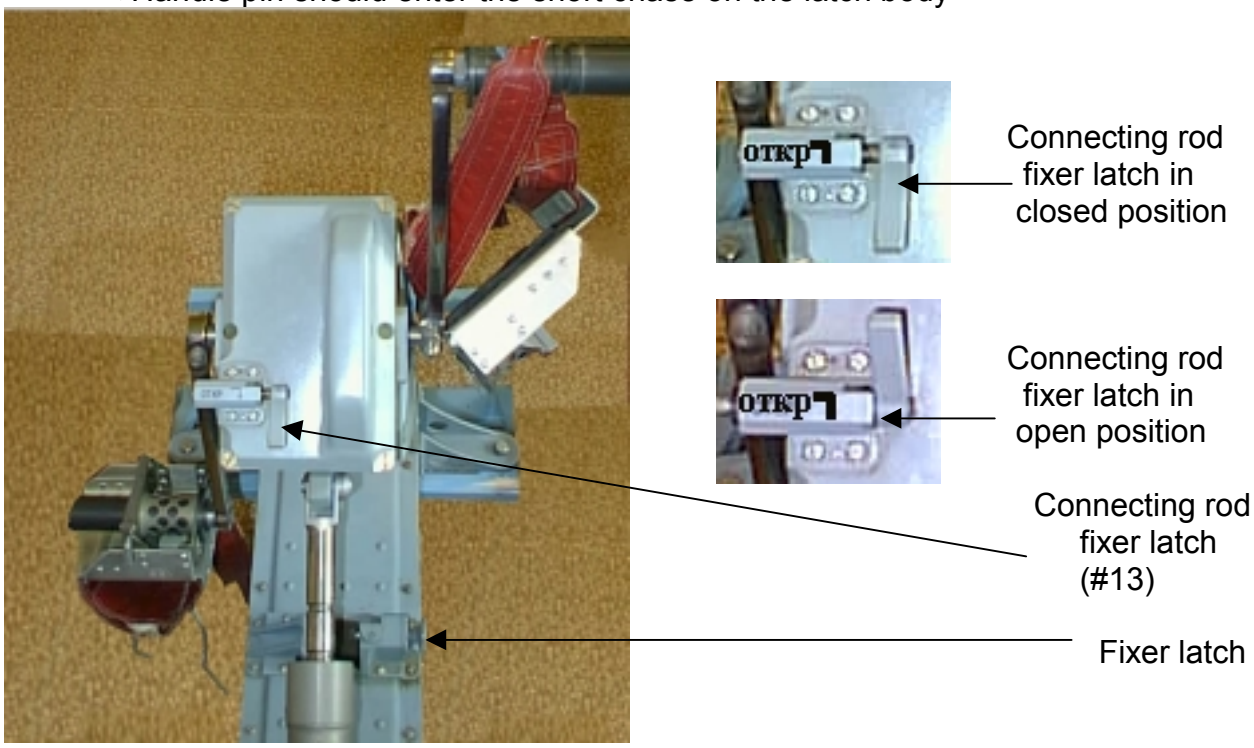


Figure 5.15

9. During foot pedaling:
   √ pedal is secured on handle (see Figure 5.12 p. 5-13 and Figure 5.16 p. 5-16)

   During hand pedaling:
   ↓ fixer latch and remove pedal from the handle
   Stow pedal in seat casing pocket
   Button down the seat casing pocket

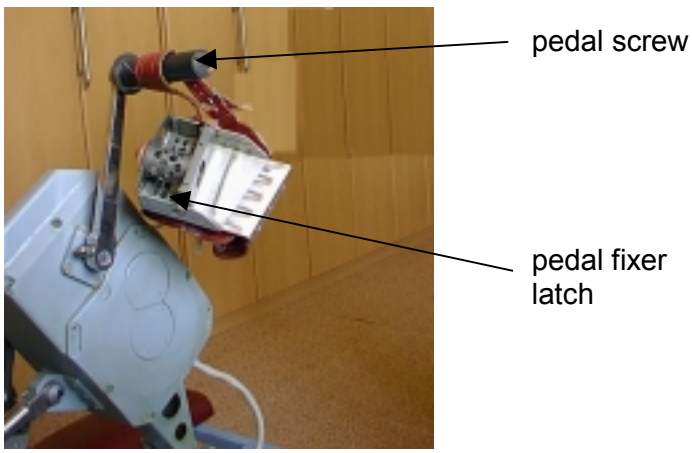


Figure 5.16

OPTION 2

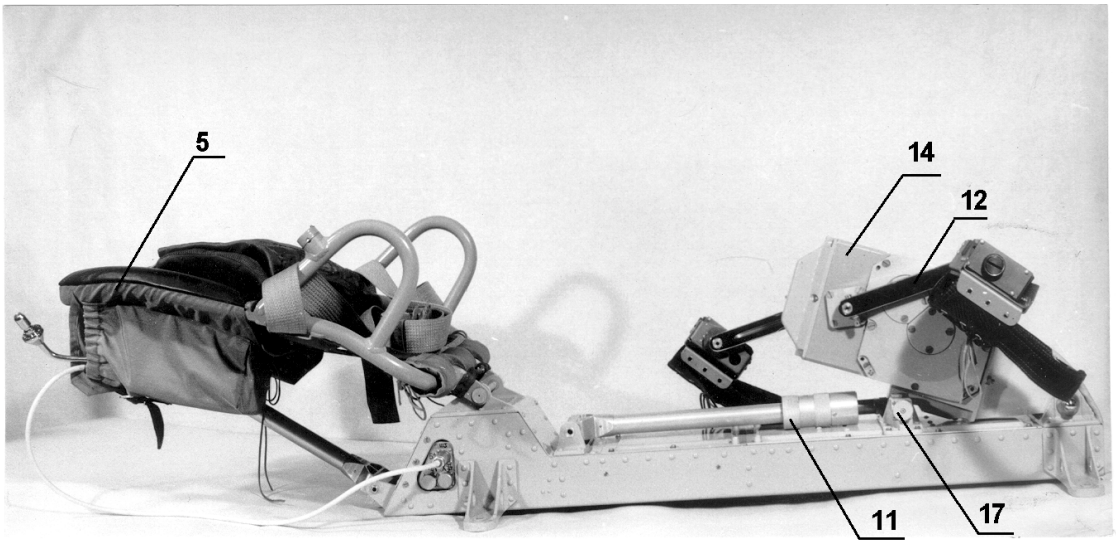


Figure 5.17 Cycle ergometer position in non-working configuration (Option 2)

1. Arrange seat (#5) into working configuration, by pulling seat rod sleeve (#4) in the arrow direction
   Secure seat and release sleeve

2. Move control panel from non-working to working position

3. Unlock generator assembly (#14) from transport configuration by pulling fixer latch button (#17)
   Lift generator assembly to reach the first fixed position

4. Arrange generator assembly into working position by pulling the sleeve (#11) in arrow direction and secure generator assembly by releasing the sleeve

5. Unlock connecting rod (#12) of pedal gear shaft from transport configuration:
   Pull out fixer latch (#13) handle and rotate in arrow direction to OPEN position (see Figure 5.15 p. 5-16)
   ◅ Handle pin should enter the short chase on fixer latch body

6. During foot pedaling:
   √ pedal is secured on handle (see Figure 5.12 p. 5-13 and Figure 5.16 p. 5-16)

   During hand pedaling:
   ↓ fixer latch and remove pedal from the handle
   Stow pedal in seat casing pocket
   Button down the seat casing pocket

5.4.2. CYCLE ERGOMETER ADJUSTMENT

1. Pull out fixer latch sleeve on corresponding rod in the arrow direction
2. Adjust generator assembly or seat position as comfortable
3. Release fixer latch sleeve
4. Move generator assembly or seat until it clicks

5.4.3. CYCLE ERGOMETER STOWAGE

OPTION 1 (Figure 5.14 p. 5-15)

1. Install pedal to foot pedaling position (if necessary):
   Unstow pedal from seat casing pocket
   ↓ fixer latch
   Install pedal onto handle
2. Secure connecting rod (#12) of pedal gear shaft by moving connecting rod fixer latch (#13) into closed position
3. Secure generator assembly in frame bracket by pulling sleeve in arrow direction
   Lower generator assembly on frame so that fixer latch would enter the opening on generator assembly
4. Remove control panel from seat handrail
   Stow control panel into seat casing pocket
   Button down the seat casing pocket
5. Fasten the belt (#6)
6. Disconnect seat rod (#3) from frame (#16), by depressing handles (#2) of rod fixer latch and clear rod fixer latch fingers of bracket (#1) hole
   Release rod fixer handles
7. Lower seat onto generator assembly (#14), by engaging belt (#6) on the right connecting rod of pedal gear shaft
8. Secure disconnected rod (#3) end on seat, by donning elastic hold-down on rod fixer latch handles (#2)
9. Lower cycle ergometer under floor panel 121, by closing panel 121

OPTION 2 (Figure 5.17 p. 5-17)

1. Install pedal to foot pedaling position:
   Unstow pedal from seat casing pocket
   ↓ fixer latch
   Install pedal onto handle

2. Secure connecting rod (#12) of pedal gear shaft by moving connecting rod fixer latch (#13) into closed position

3. Secure generator assembly in frame bracket by pulling sleeve in arrow direction
   Lower generator assembly on frame so that fixer latch would enter the opening on generator assembly

4. Pull sleeve (#4) in arrow direction
   Put seat (#5) into horizontal position
   Release sleeve

5. Move cycle ergometer control panel on seat handrail from working to non-working position

5.4.4. TROUBLESHOOTING

Symptom	Probable cause	Corrective action(s)
Resistance load is not affected by selected resitance load:		
1) low resistance load	Poor contact in cable connection between generator assembly and control panel	√cable connection (connector "Ш" on generator assembly)
2) medium resistance load	Poor contact in cable connection between generator assembly and control panel	√cable connection (connector "Ш3" on control panel)
3) high resistance load	One of generator's coils is shorted	Work in the available operating mode until cycle ergometer is replaced
Generator assembly or seat cannot be secured in desired position	Fixer latch assembly mechanism is broken	Work in the available position until cycle ergometer is replaced
Pedal movement is too stiff	Pedal mechanical problem, ball bearing might be jammed	Release pedal ball bearing fastening nut
Toe clip gets spontaneously unclasped	Toe clip lock failure	Tie straps in a knot
When pedaling, connecting rod fixer latch makes clicking noises	Connecting rod fixer latch is set to rod fixing position	Set fixer latch to "ОТКР" (Open) position
Generator assembly cannot be automatically secured in stowed configuration	1. Fixer latch gets jammed in the body 2. Locking axes of the mated parts are misaligned	Secure generator assembly by pulling off fixer latch button

All other cycle ergometer problems should be corrected per **MCC** instructions

5.5. CHEST EXPANDER SET

Purpose:

To be used during strength physical exercise for various muscle groups:

short expander - for shoulder muscles
medium expander - for trunk muscles
long expander - for leg and trunk muscles

Expander set is stowed in the packing bag

Expander - is a set of bungee cords
Long and short expanders are supplied with shoulder pads with changeable covers

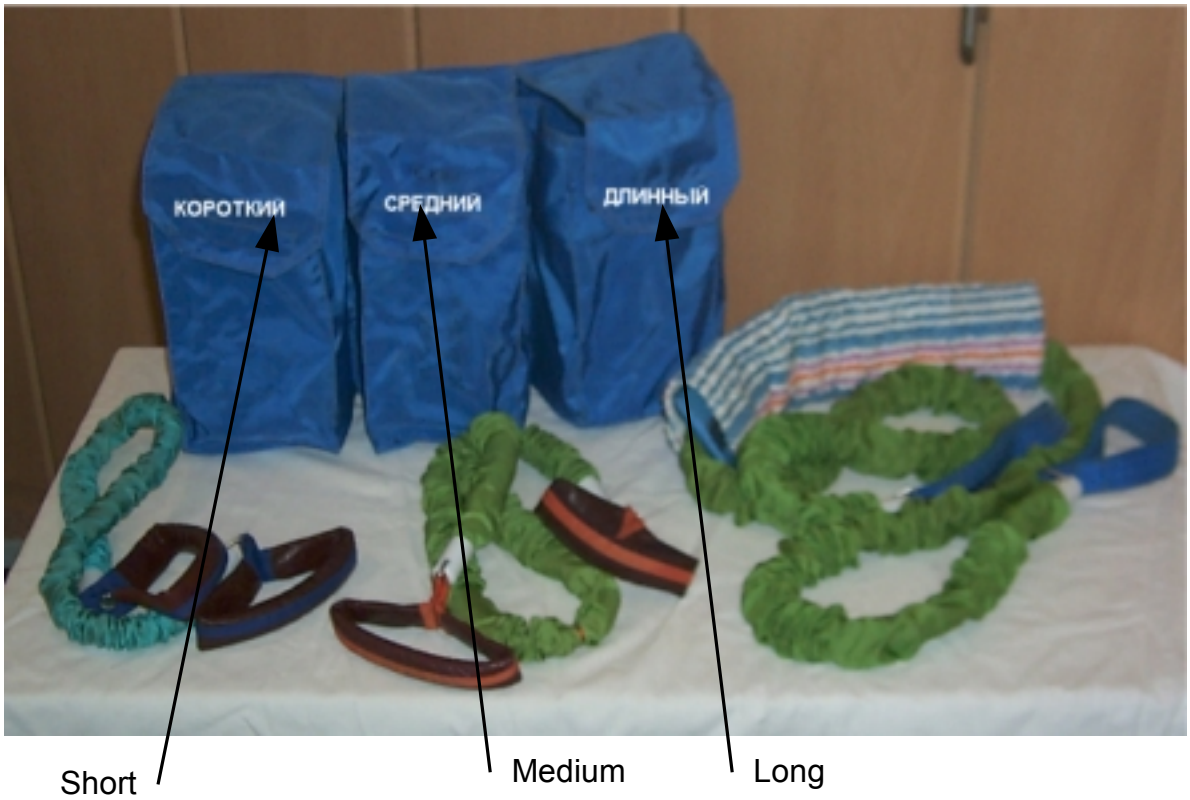


Figure 5.18 Bag with Expander Set

5.6. TONUS-3 MYOELECTROSTIMULATOR

Purpose:

Muscle electrostimulation, countermeasure for neuro-muscle deconditioning

Hardware Components (see Figure 5.19 p. 5-22):

- TONUS-3 IMPULSE GENERATOR

- TONUS bag with electrodes	- electrodes (thigh, calf, abdomen-back, trapezoids)
- TONUS bag with electrodes	- electrodes (thigh, calf, abdomen-back, trapezoids), cables
- TONUS bag with cables	- cables 2, 3, 4

Specifications:

Power supply:	from ППС-24
Power consumption:	8 W

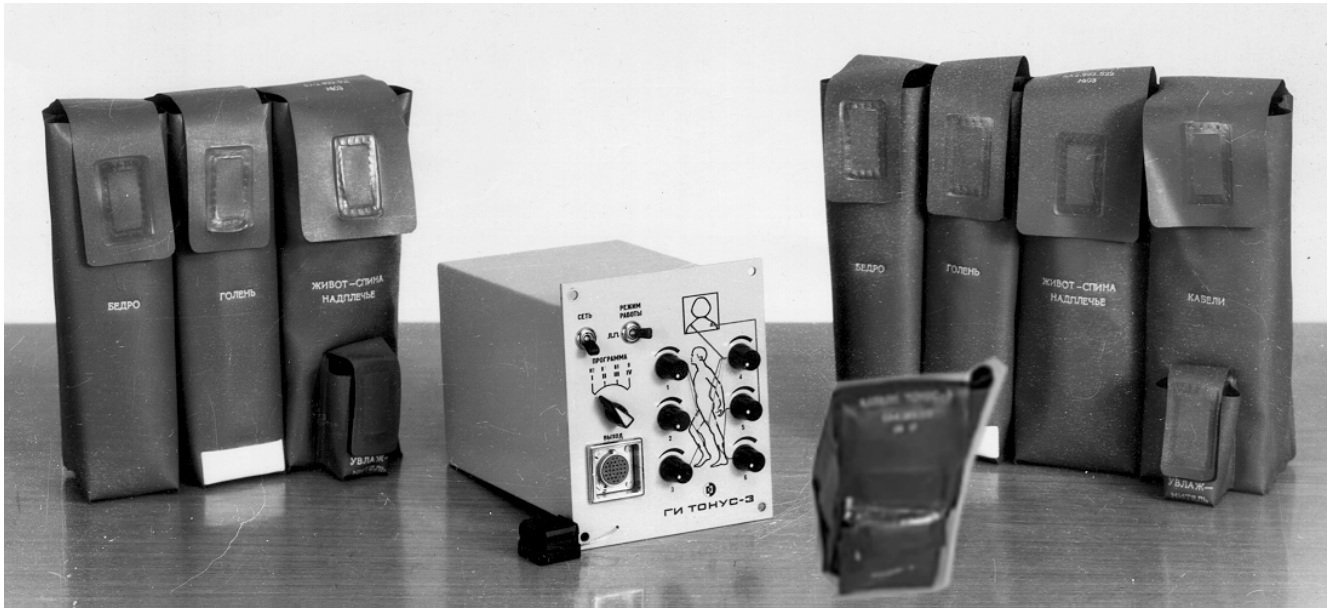


Figure 5.19 General View of Myoelectrostimulator TONUS-3 and kits

Location:

TONUS-3	Medical locker
Bags with electrodes and cables	Medical locker, container 3

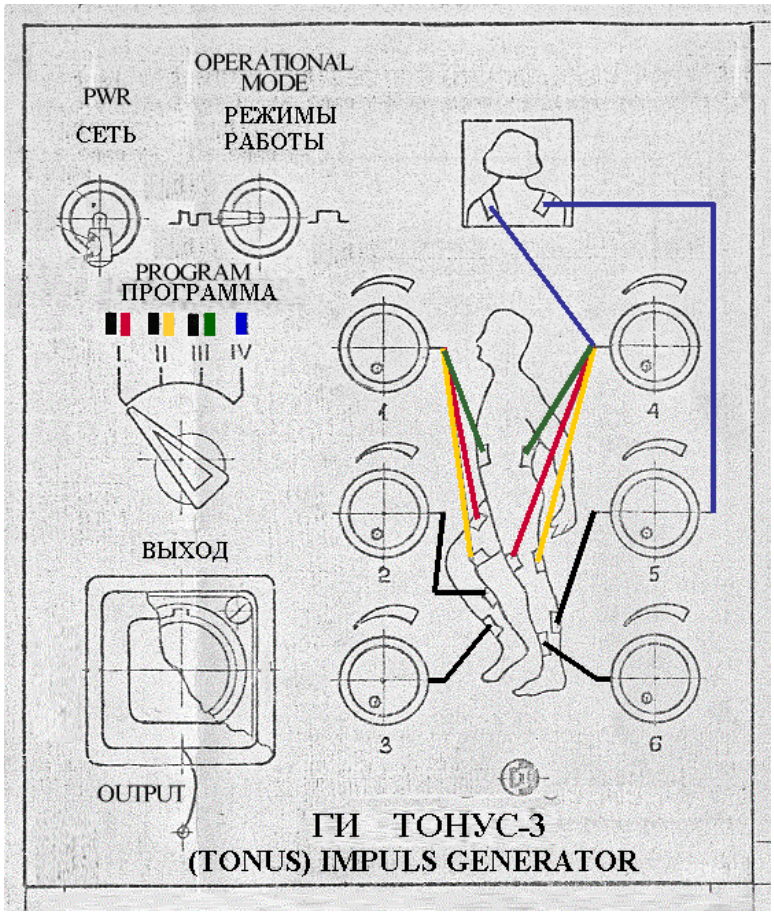


Figure 5.20 Impulse Generator Front Panel

Impulse generator controls (on front panel) (see Figure 5.20):

sw PWR → ON
sw OPERATIONAL MODE - selection of stimulation signal duration:
⎍⎍⎍ - fast contraction mode ⎍⎍ - slow contraction mode
sw PROGRAM - 4 programs (I, II, III, IV)
knobs 1-6 - adjustment of current pulse amplitude of the stimulating signal
cnctr OUTPUT - for connection of cable with electrodes
electrode application sites mnemonic diagram

sw PROGRAM → I:

muscle stimulation:
shin anterior and posterior surface
thigh anterior surface
color - black, red

sw PROGRAM → II:

muscle stimulation:
shin anterior and posterior surface
thigh posterior surface
color - black, yellow

sw PROGRAM → III:
muscle stimulation:
shin anterior and posterior surface
abdomen and back
color - black, green

sw PROGRAM → IV
trapezoids stimulation:
color – blue

On impulse generator back panel – connector PWR and grounding strap terminal

Electrode set - for one crewmember

Electrode straps are color coded according to application site

Trapezoid muscle electrodes are secured via two vertical and horizontal straps (straps are secured with Velcro - on the back and with hook - on the front)

Electrode connectors are color-coded according to mnemonic diagram seen on the device

Cable 1	electrode leads from right shin, left shin, right thigh, left thigh, abdomen, back to TONUS IMPULSE GENERATOR
Cable 2	electrode leads from trapezoids to TONUS IMPULSE GENERATOR
Cable 3	connects CHIBIS suit to TONUS IMPULSE GENERATOR
Cable 4	electrode leads from thigh, shin, abdomen and back to CHIBIS suit
Cables 3+4	electrode leads from thigh, shin, abdomen and back to TONUS IMPULSE GENERATOR

Figure 5.21 Contents of bag labeled "Электроды Тонус" (Tonus Electrodes)

Figure 5.22 Contents of bag labeled "Кабели Тонус" (Tonus Cables)

Figure 5.23 Application of abdomen-back and trapezoid electrodes with cables

Figure 5.24 Application of thigh and shin electrodes with cables

5.7. CHIBIS — PREVENTIVE LBNP SET

Purpose:

To provide negative pressure around the lower part of the crewmember's body intended for training and prevention of cardiovascular disorders

Technical Characteristics:

Negative pressure range	from 10±3 to 60±5 mmHg
Safety valve negative pressure setpoint	60±5 mmHg
Compression force inside Chibis suit (ПВК-1)	from 10 to 60 kgf
Power supply from ППС-24	
Power consumption	≤ 25 W
ПВК-1 operating life	200 donning cycles
ПВК-Д unit operating life	200 hours

Location:

ПВК-1	panel 126
ПВК-Д unit	panel 230

Components:

Chibis suit (ПВК-1)
Chibis suit pressure control unit (ПВК-Д)
Hose harness in kit
ПВК-1 removable waist seal curtain in kit

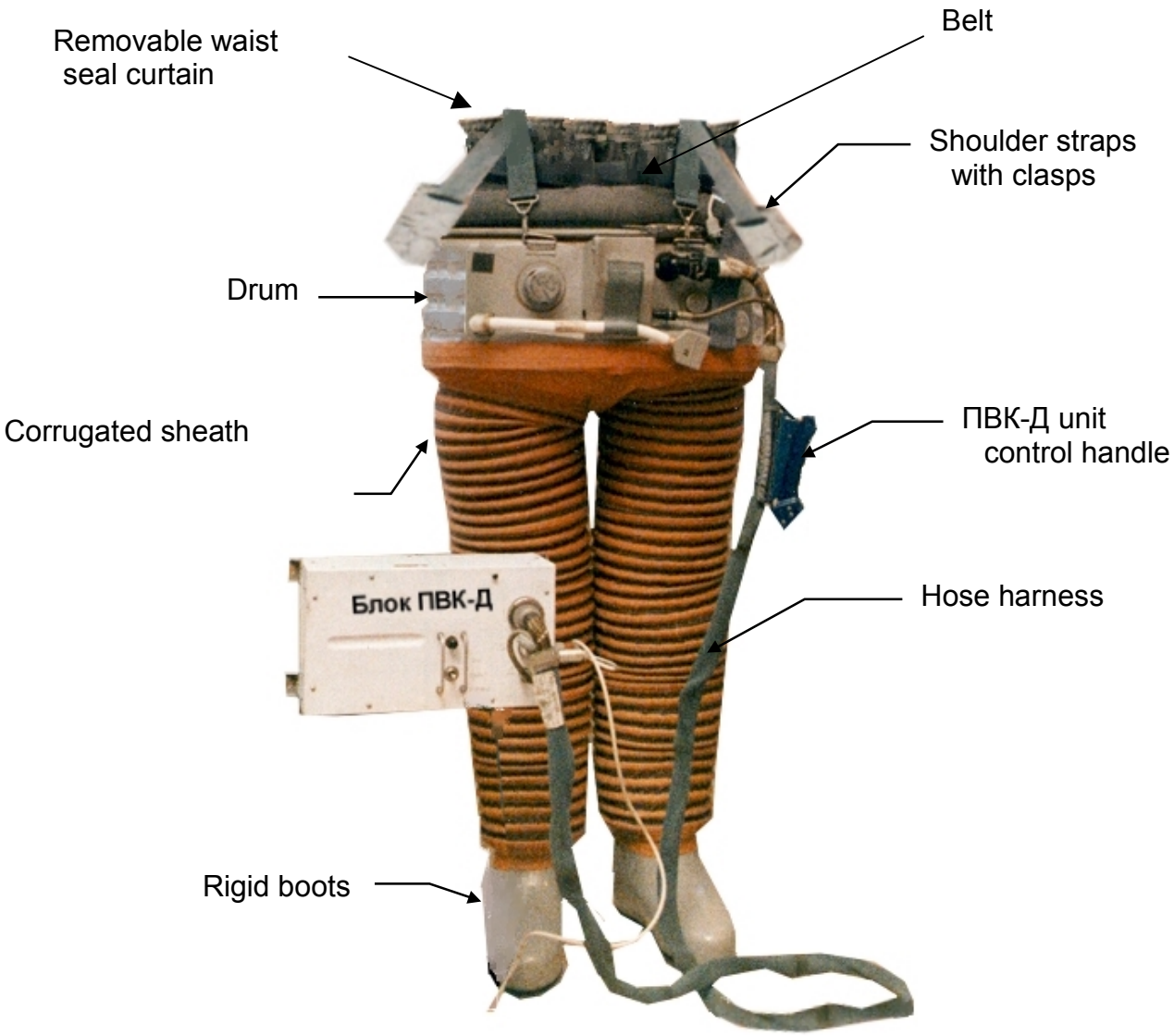


Figure 5.25 Chibis Suit (ПВК-1)

When folded for storage, pants (drum and corrugated sheath) are secured with shackle strap

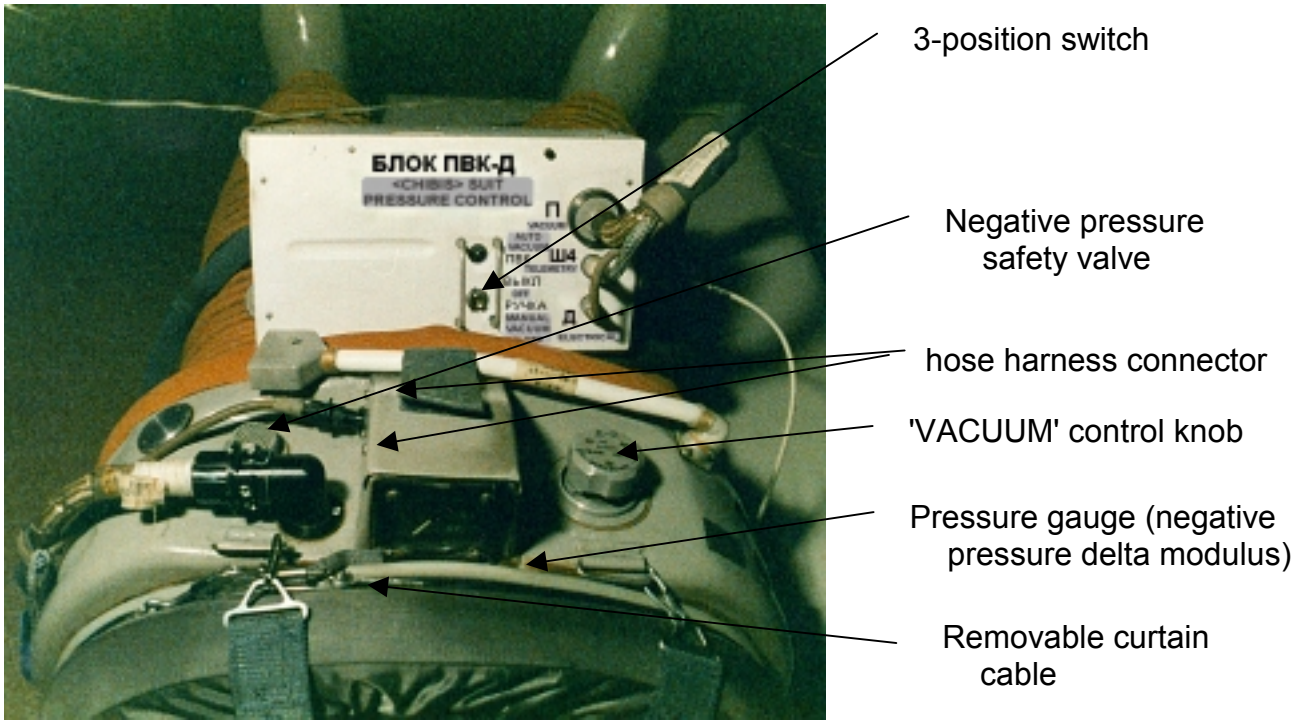


Figure 5.26 Drum and Chibis Suit Pressure Control

Purpose of Suit Pressure Control:

To create negative pressure inside the Chibis Suit

Suit Pressure Control Contains:

Micropump
Radio interference filter
Pressure sensor

Suit Pressure Control Switch Positions:

AUTO VACUUM	power on
OFF	power off
MANUAL VACUUM DUMP	remote power control from control unit handle

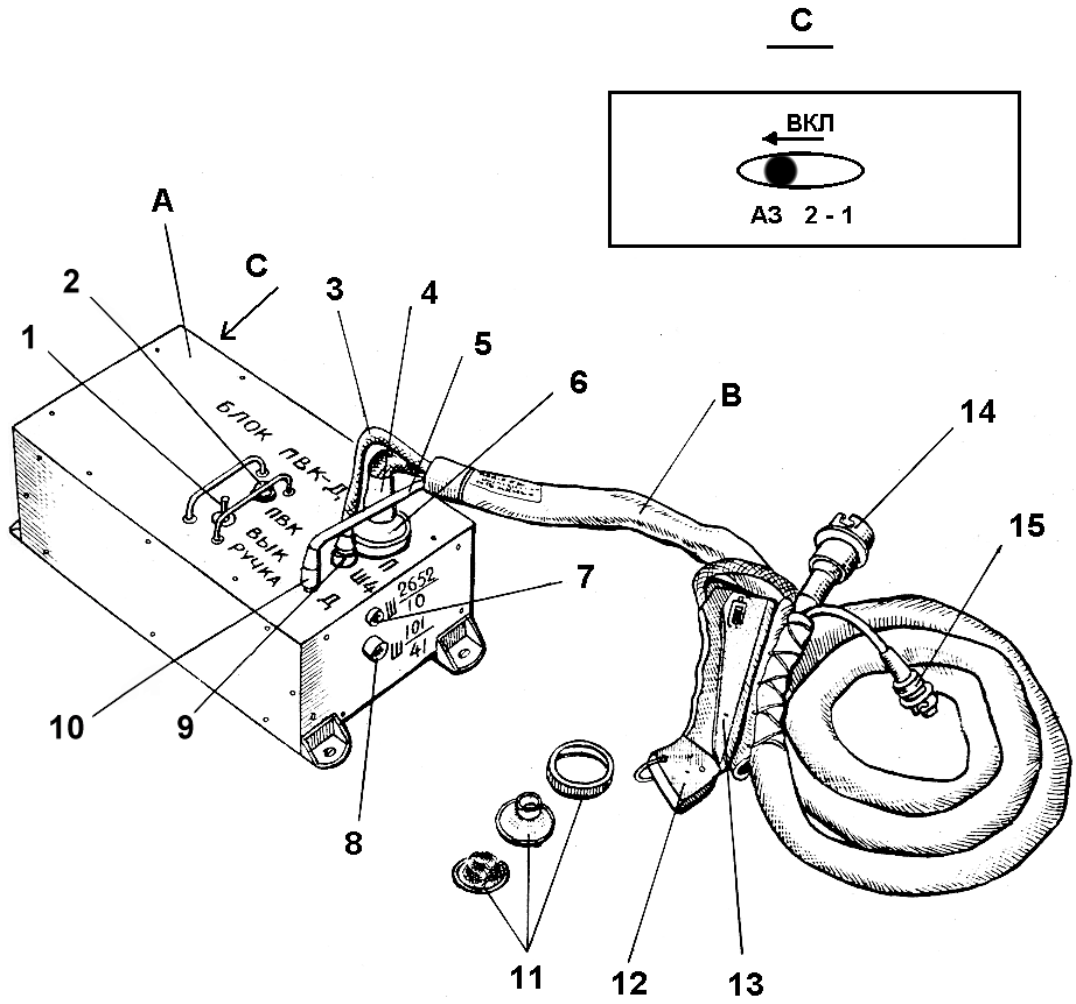


Figure 5.27 Suit Pressure Control and Hose Harness

A	Suit Pressure Control
B	Hose harness
C	A3 2-1 circuit breaker switch view
1	3-position switch
2	power indicator light
3	cable with Suit Pressure Control handle
4	ПВК hose
5	ИКД hose
6	connector П with filter (for micropump ПВК hose connection)
7	power cable connector
8	telemetry data cable connector
9	connector Ш4 (for cable with ПВК-Д control unit handle connection)
10	connector Д (for ИКД hose pressure sensor connection)
11	П2 connector filter components
12	Suit Pressure Control control handle
13	Lever switch on control handle
14	ПВК hose connector for ПВК-1 suit connection
15	ИКД hose connector for ПВК-1 suit connection

NOTE

1. If the set negative pressure is not established in ПВК-1 while micropump is operating and curtain is well-sealed, check filter mesh screen for any obstructing debris:
   Unscrew filter nut on connector П2 of Suit Pressure Control
   Remove filter flanged socket by pulling at connector
   Remove filter mesh screen, clean it and reinstall into place
   Reinstall flanged socket into place and tighten nut to the stop
2. To facilitate mating, periodically grease air connectors (grease is located in ЗИП-1 ОРЛАН-ДМ kit pocket)

5.7.1. WAIST SEAL CURTAIN/CORRUGATED SHEATH

1. Obtain adhesive plastic sheet from ПВК-1 suit kit pocket

2. Patch the punctured surface with plastic sheet:
   Apply the preparation patch onto the external surface of the sheath
   After 2 min remove the patch (for sheath surface cleaning)
   Apply a new smaller patch onto the prepared site,
   not touching it with fingers
   Warm up the new patch with palm and smooth it up (patch is transparent)

5.7.2. REMOVABLE WAIST SEAL CURTAIN

1. Clasps on shoulder straps ↔ drum

2. Open cable tensioning lock on the drum and free up cable

3. Remove waist seal curtain from the drum

4. Place new curtain on the drum
   √ marks on the back of the drum and curtain are aligned

5. Put cable in the chase and wind it twice around the drum

6. Engage the cable tensioning lock

7. Shoulder strap clasps →← drum

5.8. KENTAVR PROTECTIVE SUIT

Purpose:

Countermeasure for circulatory disturbance
Prevents crewmemeber from overloading during descent
Increases ortostatic tolerance during post-flight adaptation

Usage:

During descent, landing, and after landing

Donning:

Prior to entry into Soyuz

Suit Components :

Kentaver:

shorts	1 ea.
gaiters	1 pair
short underpants (in plastic bag)	1 ea.

Kamelia-A underwear set (in plastic bag):

jersey	1 ea.
underpants	1 ea.
socks	1 pair

Stowage bag	1 ea.

5.8.1. DONNING AND ADJUSTING KENTAVR SUIT

NOTE

To adjust Kentaver — there is lacing available on the outer side of the shorts and on the inner side of the gaiters. Crewmember's name and suit size are found on shorts Velcro belt flap, gaiters flaps and bag.

1. Unstow bag with Kentaver intended for a particular crewmember

2. Obtain from the bag: shorts, gaiters, and short underpants (in a plastic bag)
   Unstow short underpants from plastic bag and don

3. Obtain Kamelia-A underwear set (in a plastic bag) from the stowage bag
   Unstow jersey from plastic bag and don

4. Undo all zippers on shorts, gaiters

5. Don shorts and pull them up (so that they would fit snugly around groin area)

6. Fasten zipper and Velcro belt flap

7. Don gaiters (lacing should be located on the calf's inner side)
   one with "Пр" label should be on the right calf
   one with "Л" label should be on the left calf

8. Fasten zippers

9. ◅ Ensure shorts and gaiters adjustment is uniform by acquiring a nominal position in Kazbek-У seat liner for 15-20 min

NOTE

1. Clothing should fit snugly without causing sensations of either overall or local obstructive compression.
2. If sensing any of the above, loosen lacing at that region until totally relieved.
3. Kamelia-A socks and underpants must be worn over Kentaver to prevent damage to Sokol-KB2 inner shell from gaiters metallic zipper.

10. Obtain Kamelia-A underpants and socks from the plastic bag and don them.

5.8.2. DOFFING KENTAVR SUIT

1. Doff socks and underpants from Kamelia-A set

2. Unfasten shorts Velcro belt flap and zipper
   Doff shorts

3. Doff gaiters by unfastening their zippers
   Doff jersey of Kamelia-A set and short underpants

4. Air all Kentaver components until dry (if necessary)

5. Fold and stow shorts, gaiters, short underpants in plastic bag as shown in Figure 5.30 p. 5-34
6. Stow Kamelia-A items into plastic bag

7. Stow all Kentavr items into stowage bag

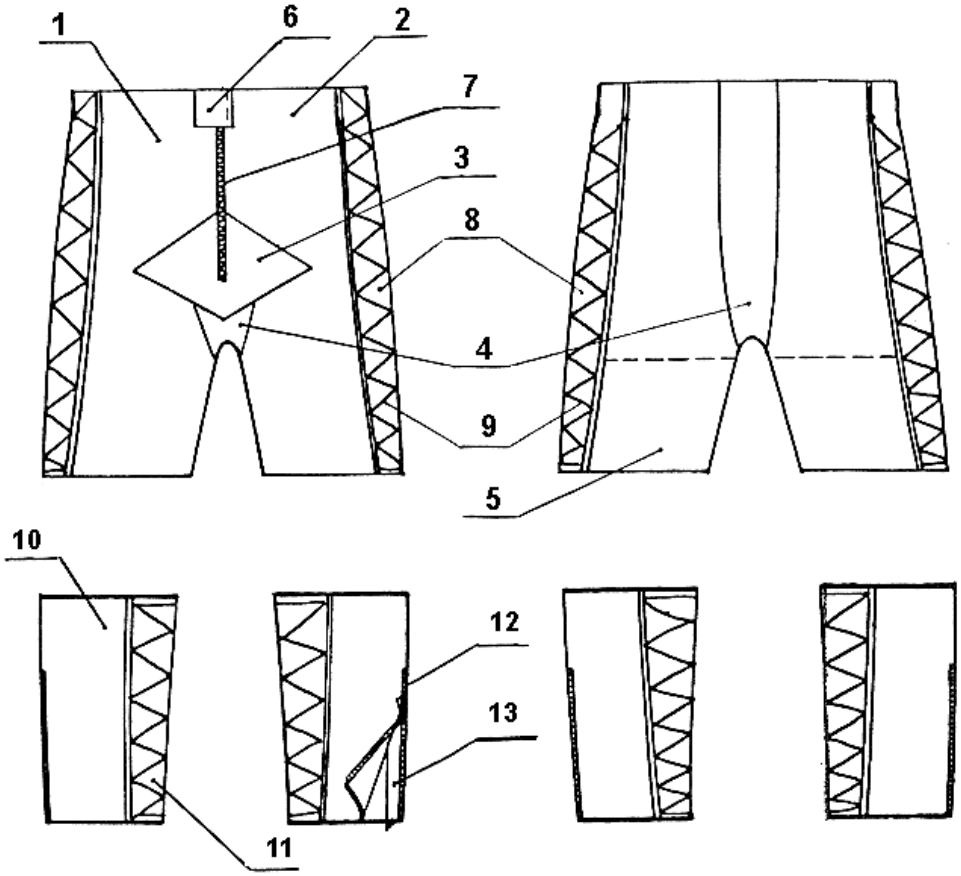


Figure 5.28 Shorts and gaiters — Front and Back View

Shorts:
1 – shorts right side
2 – shorts left side
3 – front insert
4 – shorts middle part
5 – shorts thigh part
6 – Velcro belt flap
7 – zipper
8 – side panel
9 – lacing

Gaiters:
10 – main part
11 – side panel
12 – zipper
13 – zipper flap

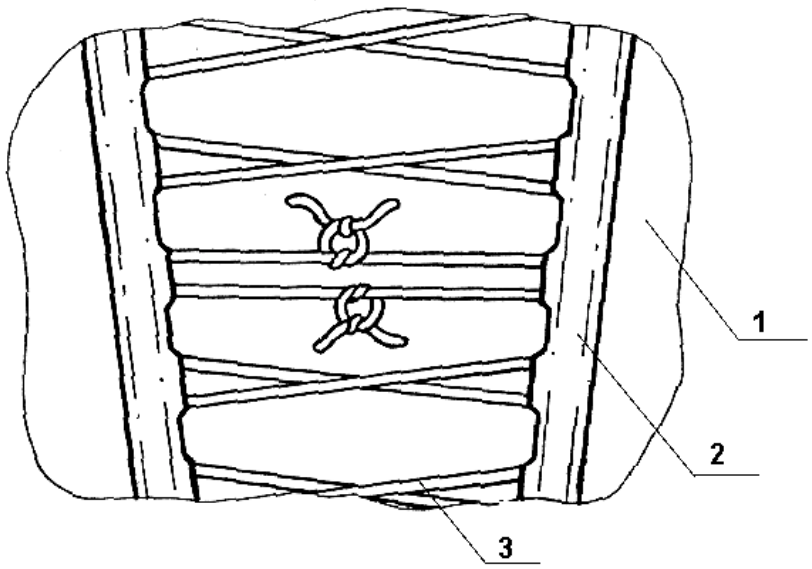


Figure 5.29 Individual adjustment system
1 – main canvas
2 – loop strap
3 – lacing

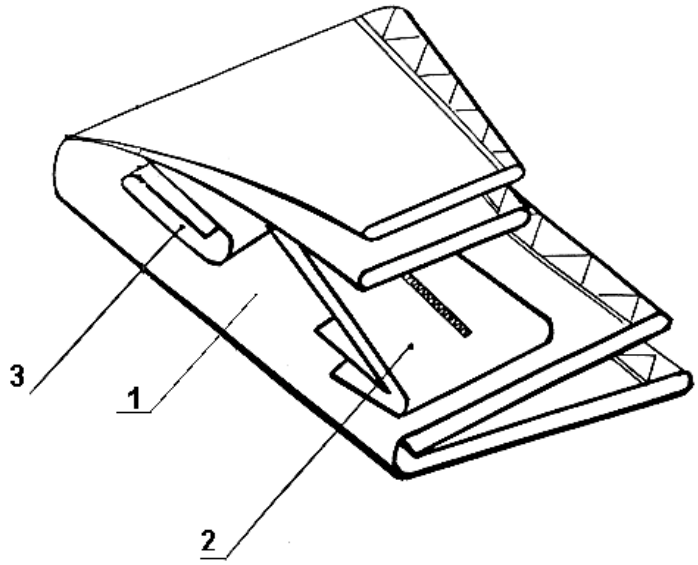


Figure 5.30 Shorts, gaiters and short underpants folded view
1 – shorts
2 – gaiters
3 – short underpants

For notes

For notes

For notes

For notes

For notes

For notes

For notes

For notes

For notes

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For notes

6. MEANS FOR MEDICAL MONITORING

6.1. GAMMA-1 SET

Purpose:

To read, amplify and convert physiological information with its subsequent transmission to recording devices (oscilloscope and telemetry communication systems):

ECG in ДS lead (ЭКГ-ДS)
ECG in three standard leads (ЭКГ-1, ЭКГ-2, ЭКГ-3)
ECG in three amplified leads (ЭКГ-aVR, ЭКГ-aVL, ЭКГ-aVF)
ECG in six chest leads (ЭКГ-V1, ЭКГ-V2, ЭКГ-V3, ЭКГ-V4, ЭКГ-V5, ЭКГ-V6)
ECG in three corrected orthogonal leads after Frank's method (ЭКГ-X, ЭКГ-Y, ЭКГ-Z)
Sphygmogram of femoral artery (СФГ-Б)
Sphygmogram of radial artery (СФГ-Л)
Sphygmogram of shin artery (СФГ-Г)
Temporal pulsogram (ВПГ)
Venous-arterial pulsogram (ВАП)
Kinetocardiogram of right and left side of heart (ККГ-П, ККГ-Л)
Tachooscillograms for determining BP after Savitskiy (АД-ТО) and Korotkov sounds (АД-ТК)
Pressure marks in АД (ОД)/BP Cuff
Rheograms after Kedrov's method (РПГ Ro/ΔR р-р)
Rheograms and differentiated rheograms in the bimastoidal lead (РПГ $Ro/\Delta R_{бм}$, РПГ $dR/dt_{бм}$)
Rheograms and differentiated rheograms from forearm, shin, lung, liver (РПГ $Ro/\Delta R_{предпл}$, РПГ $dR/dt_{предпл}$, РПГ $Ro/\Delta R_{гол}$, РПГ $dRo/dt_{гол}$, РПГ $Ro/\Delta R_{легк}$, РПГ $dR/dt_{легк}$, РПГ $Ro/\Delta R_{печ}$, РПГ $dR/dt_{печ}$)
Rheoencephalograms and differentiated rheoencephalograms in the frontomastoidal leads on the right (РПГ $Ro/\Delta R_{ф.м\ прав}$, РПГ $dR/dt_{ф.м.\ прав}$) and on the left (РПГ $Ro/\Delta R_{ф.м.\ лев}$, РПГ $dR/dt_{ф.м.\ лев}$)

Features:

Simultaneous signal recording on six channels
Incremental gain control on all channels

Specifications:

Continuous operation time:	8 hours
Power source:	ППС-24
Power consumption:	21 W (when АД unit is Off) 50 W (when АД unit is On) 80 W (when АД unit compressor is On)

Location:

GAMMA-1M	SM Medical Locker
РПГ kits and КОММУТАТОР РПГ	SM Medical Locker containers 1, 2

Hardware Composition:

GAMMA-1M hardware (Figure 6.1 p. 6-2)
КОММУТАТОР РПГ (РПГ switching unit)
Sensor units (Figure 6.2 p. 6-3):
- УСИ АД
- УСИ РЭГ-1
- УСИ ЭКГ
- УСИ ЭКГ-ОРТ
- УСИ ВАП-ККГ
- УСИ РПГ-1
- УСИ РПГ-2
- УСИ РПГ-3-01
- УСИ РПГ-4
- УСИ РПГ-5-01
- УСИ ВПГ

GAMMA-1 set (Figure 6.2 p. 6-3)
Set of User's Manuals (Figure 6.2 p. 6-3)

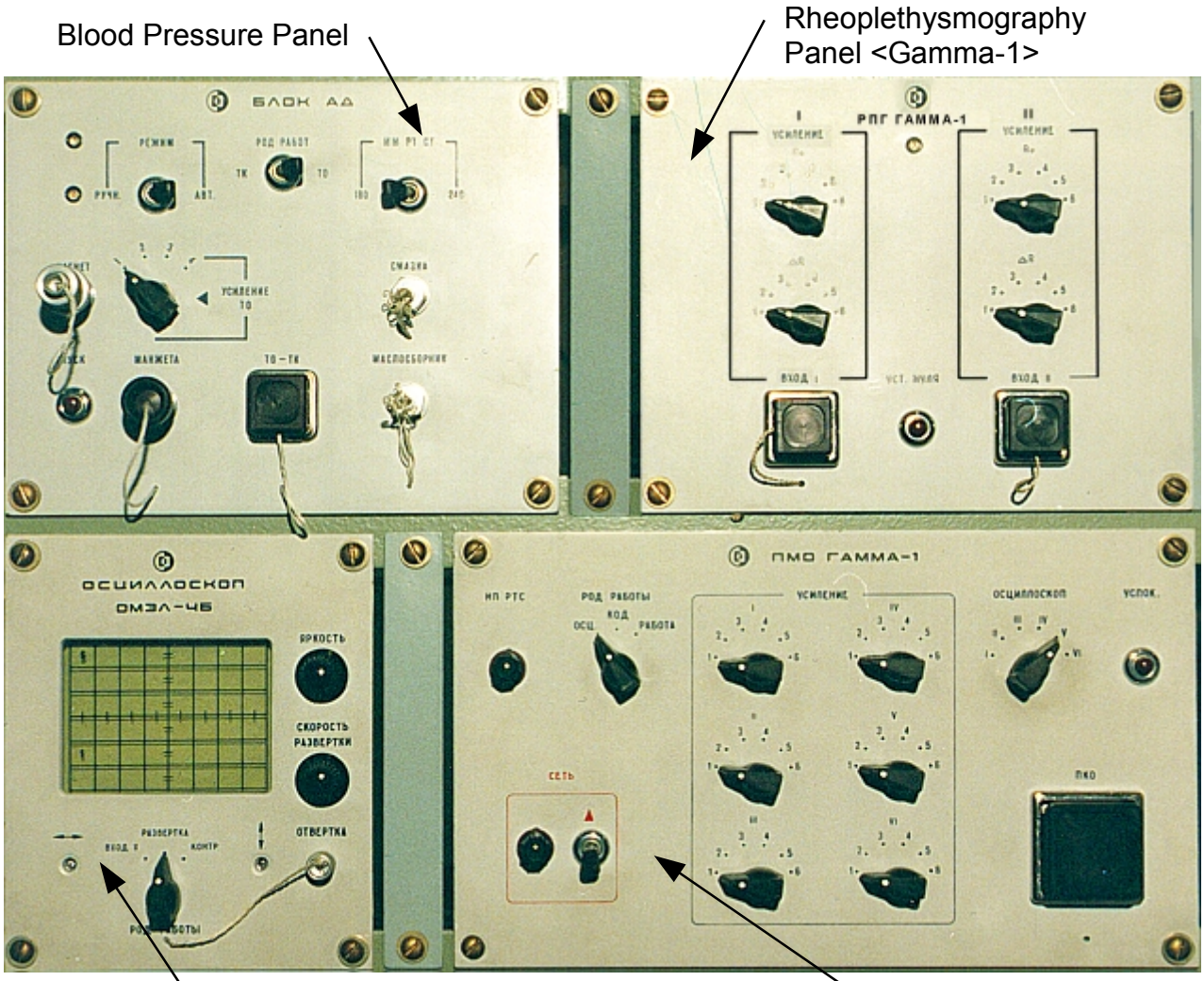
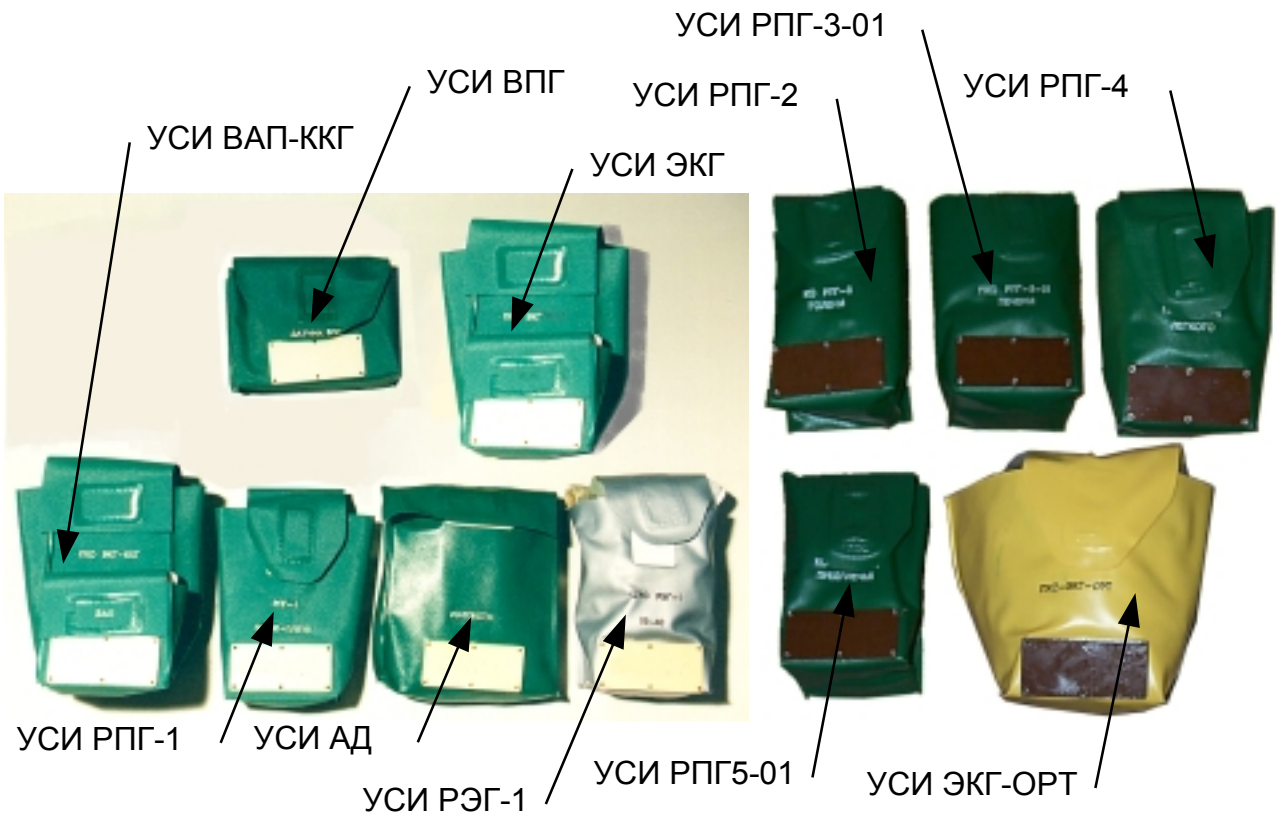


Figure 6.1 Gamma Front Panel



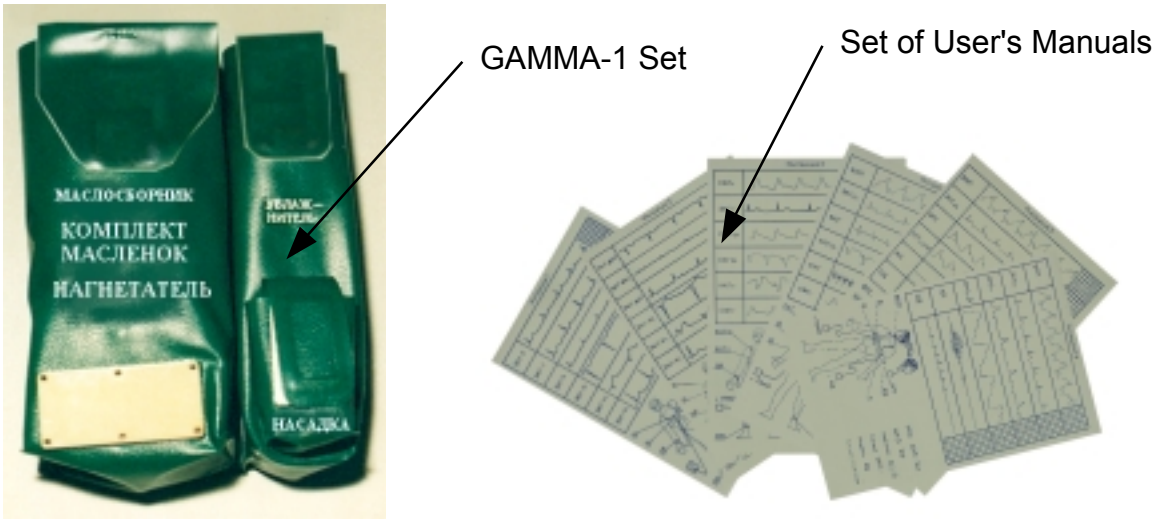


Figure 6.2 Gamma Accessories Kits

6.1.1. MEDICAL EXAM PANEL

Purpose:

Amplify and convert physiological information coming from the sensor units (УСИ) and Blood Pressure Panel, Rheoplethysmography Panel <Gamma-1>
Switch and route output signals
Simultaneously send output signals to three outputs: connectors РТС, МР, КПА (see Figure 6.4 p. 6-5)
Energize system
Manual switching each of six signals to the oscilloscope input
Incremental signal gain control

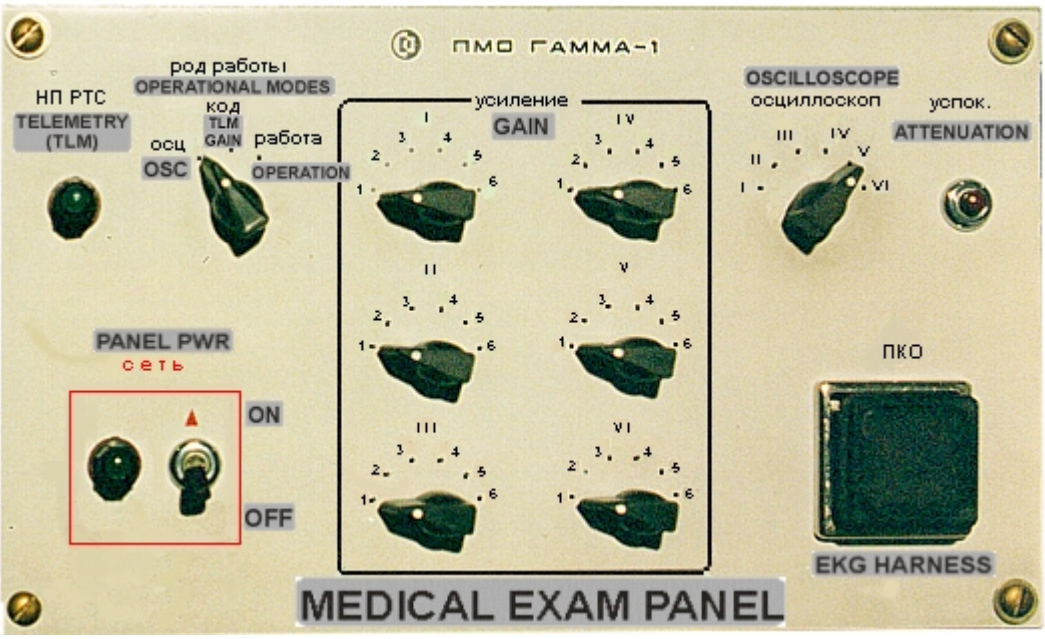


Figure 6.3 Medical Exam Panel Front View

Indicators and Controls:

sw OPERATIONAL MODES:

OSC	Transfers signals to oscilloscope and outputs with manual activation of Blood Pressure Panel via pb START (on Blood Pressure Panel)
TLM GAIN	Transfers position code signals of sw GAIN to outputs
OPERATION	Transfers signals to the outputs with Blood Pressure Panel automatic control (with preserved indication on oscilloscope)

sw PANEL PWR	Power-up/power-down Medical Exam Panel (ПМО)
sw OSCILLOSCOPE	Provides manual switching of each of six signals to oscilloscope input
sw GAIN I-VI	Provides incremental adjustment of signal gain
LED PANEL PWR	Power on indicator
LED TELEMETRY (TLM)	Not used
pb ATTENUATION	Manually sets the constant component of output signal
connector EKG HARNESS	Connects sensors unit (УСИ) lead cable

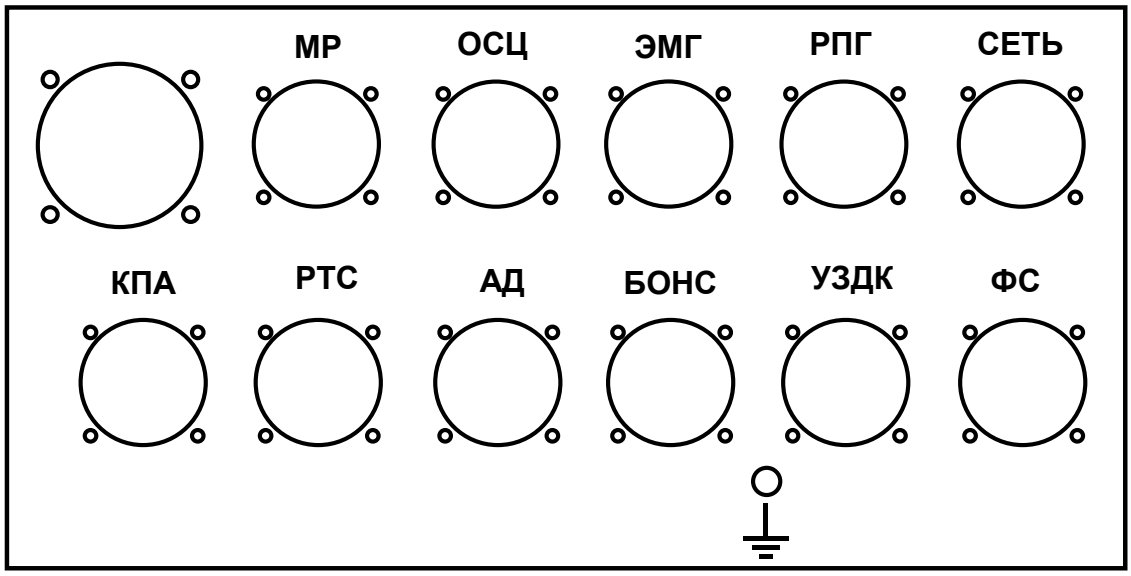


Figure 6.4 Medical Exam Panel (Back View)

6.1.2. BLOOD PRESSURE PANEL

Purpose:

Creates pressure rise/fall cycles in the cuff
Converts cuff pressure values to electrical signal
Amplifies and conditions PRESSURE WAVE FORM, KOROTKOV SOUND and PRESSURE MARK signals

Blood Pressure Panel Operating Modes:

From installed pressure source/compressor (sw MODE → AUTO)
From manual compressor pump (sw MODE → MANUAL)

Compressor Activation Modes:

Manual activation: via pb START (sw OPERATIONAL MODES → OSC on MEDICAL EXAM PANEL)

Automatic activation: first cycle begins after pb START is pressed, each BP measurement takes place 80±20 sec after completion of preceding measurement (sw OPERATIONAL MODES → OPERATION on MEDICAL EXAM PANEL)

Pressure increase rate in the cuff:

sw OPERATIONAL MODE → PRESSURE WAVE FORM	4 mmHg
sw OPERATIONAL MODE → KOROTKOV SOUND	24 mmHg

Pressure decrease rate in the cuff:

sw OPERATIONAL MODE → PRESSURE WAVE FORM	24 mmHg
sw OPERATIONAL MODE → KOROTKOV SOUND	4 mmHg

Indicators and Controls:

LED (upper)	unit activation indication
LED (lower)	manual mode indication
pb START	to issue command to initiate one measurement cycle
sw OPERATIONAL MODE	selects measuring method (PRESSURE WAVE FORM-KOROTKOV SOUND)
sw MODE	switches operating mode (MANUAL-AUTO)
sw mm Hg	switches measuring ranges (180-240)
sw GAIN	incrementally regulates tachooscillogram signal amplitude
socket CUFF	for cuff connection

socket INFLATE	for manual pump connection
connector PRESSURE-SOUND	for cuff sensors connection
socket LUBE MOTOR	supplies lubricant to the compressor
socket LUBE COLLECTION	catches excess lubricant

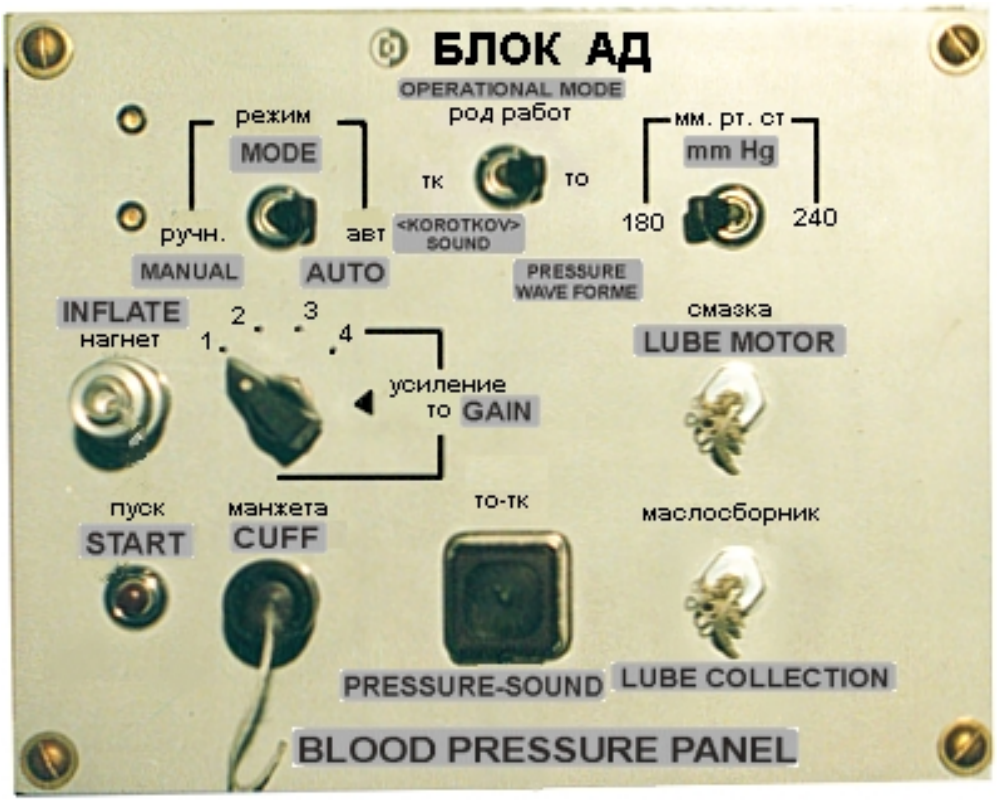


Figure 6.5 Blood Pressure Panel (Front View)

6.1.3. RHEOPLETHYSMOGRAPHY PANEL <GAMMA-1> WITH КОММУТАТОР РПГ (RHEOPLETHYSMOGRAPHY PANEL <GAMMA-1> SWITCHING UNIT)

Purpose of РПГ:

To convert the electrical resistance active component for the examined part of the body, and deriving base resistance signals and rheograms from it
To differentiate rheogram signal

Base resistance (R_O): degree of blood flow in the examined part of body
Rheogram (ΔR): pulsed flow of blood through tissues
Differential rheogram (dR/dt): rate of pulsed fluctuations in blood flow

Unit provides alternating output of base resistance and rheogram signals via one channel

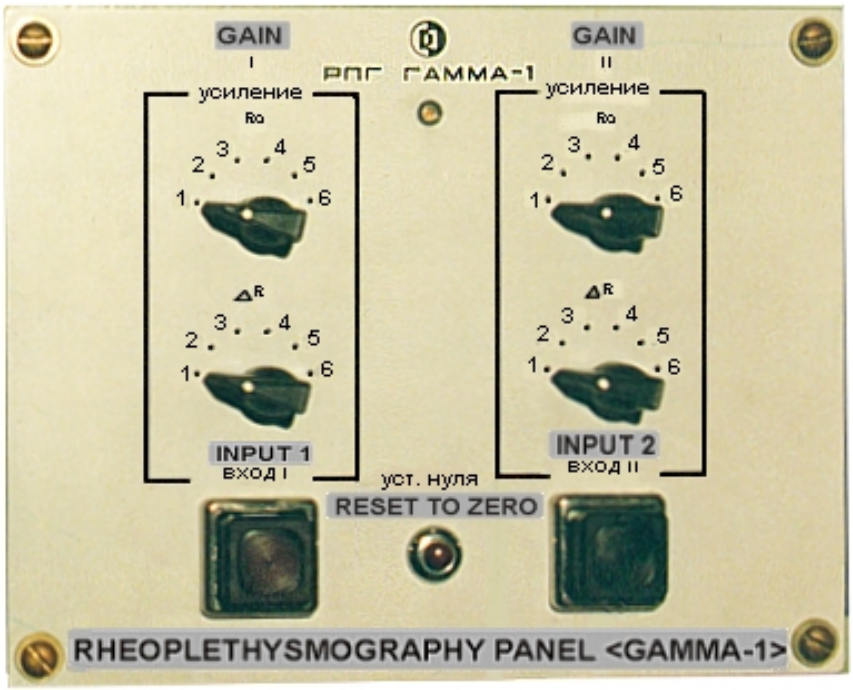


Figure 6.6 Rheoplethysmography Panel <Gamma-1> (Front View)

Indicators and Controls:

LED	unit activation indication
sw GAIN I sw GAIN II	incrementally regulates signal amplification
pb RESET TO ZERO	outputs zero level for evaluating base resistance
connector INPUT 1 and connector INPUT 2	sensor unit cable connection

Purpose of КОММУТАТОР РПГ (РПГ Switching Unit):

To connect rheographic sensor units to the RHEOPLETHYSMOGRAPHY PANEL <GAMMA-1> unit inputs according to switching program (see Table 6.1 p. 6-10)

Figure 6.7 КОММУТАТОР РПГ (Front View)

connector OUTPUT - connection of КОММУТАТОР РПГ to RHEOPLETHYSMOGRAPHY PANEL <GAMMA-1> inputs

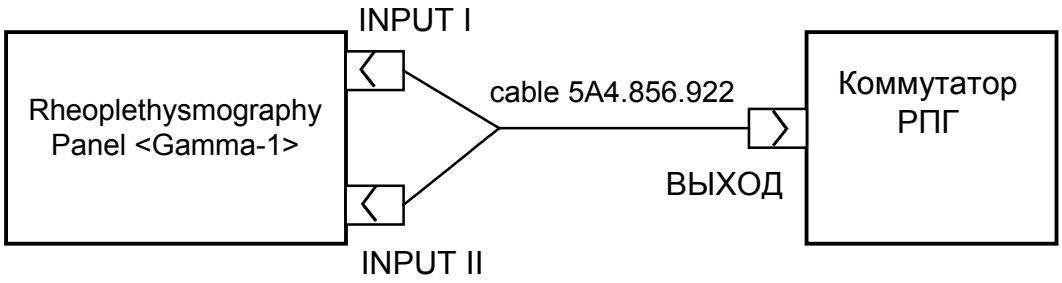


Figure 6.8 Rheoplethysmography Panel <Gamma-1> and КОММУТАТОР РПГ Connection Diagram

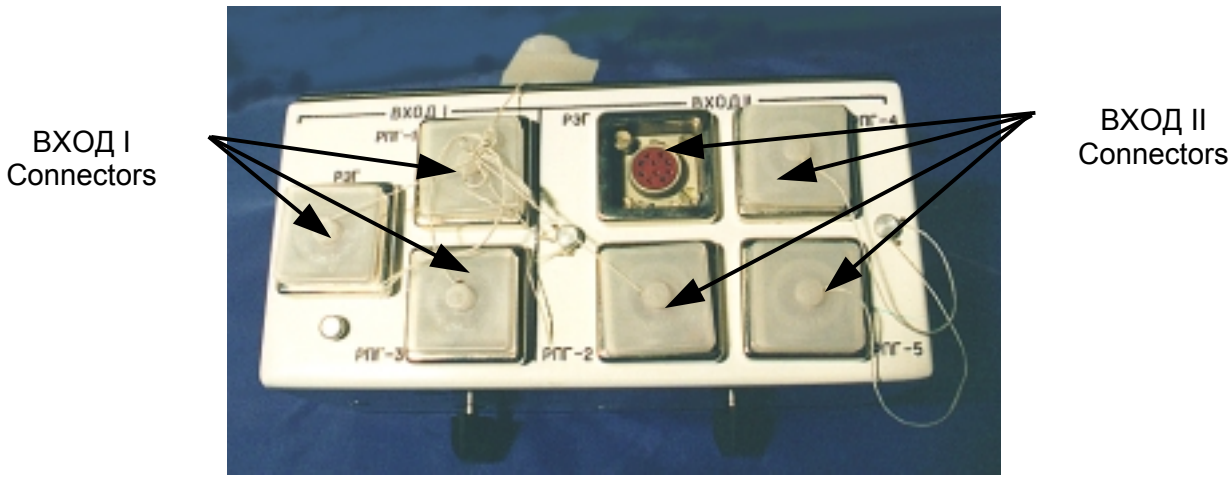


Figure 6.9 КОММУТАТОР РПГ (Top View)

connector ВХОД I and connector ВХОД II - connection of sensor unit cable to КОММУТАТОР РПГ

Table 6.1 Sensor unit conection to Rheoplethysmography Panel <Gamma-1> via КОММУТАТОР РПГ

Program number	Position of КОММУТАТОР РПГ sw ПРОГРАММА		Sensor units connected to КОММУТАТОР РПГ	
	Left	Right	INPUT I	INPUT II
1	1	ВЫКЛ (Off)	РПГ-1 (UPPER ARM-UPPER ARM)	—
2	2	ВЫКЛ (Off)	РЭГ (rheoencephalo-gram)	—
3	3	ВЫКЛ (Off)	РПГ-1 (UPPER ARM-UPPER ARM)	РПГ-5-01 (FOREARM)
4	ВЫКЛ (Off)	4	РПГ-3-01 (LIVER)	РПГ-4 (LUNG)
5	ВЫКЛ (Off)	5	РЭГ	РПГ-2 (SHIN)
6	ВЫКЛ (Off)	6	РЭГ -1	РЭГ -1

NOTE

The ВПГ sensor connector must be connected to the ВПГ connector on the ПКО ЭКГ-ККГ while working according to program 1, 3 (see Table 6.1)

6.1.4. OSCILLOSCOPE ОМЭЛ-4Б

Purpose:

Display of physiological signals for visual monitoring
(sw OPERATIONAL MODES → SWEEP)

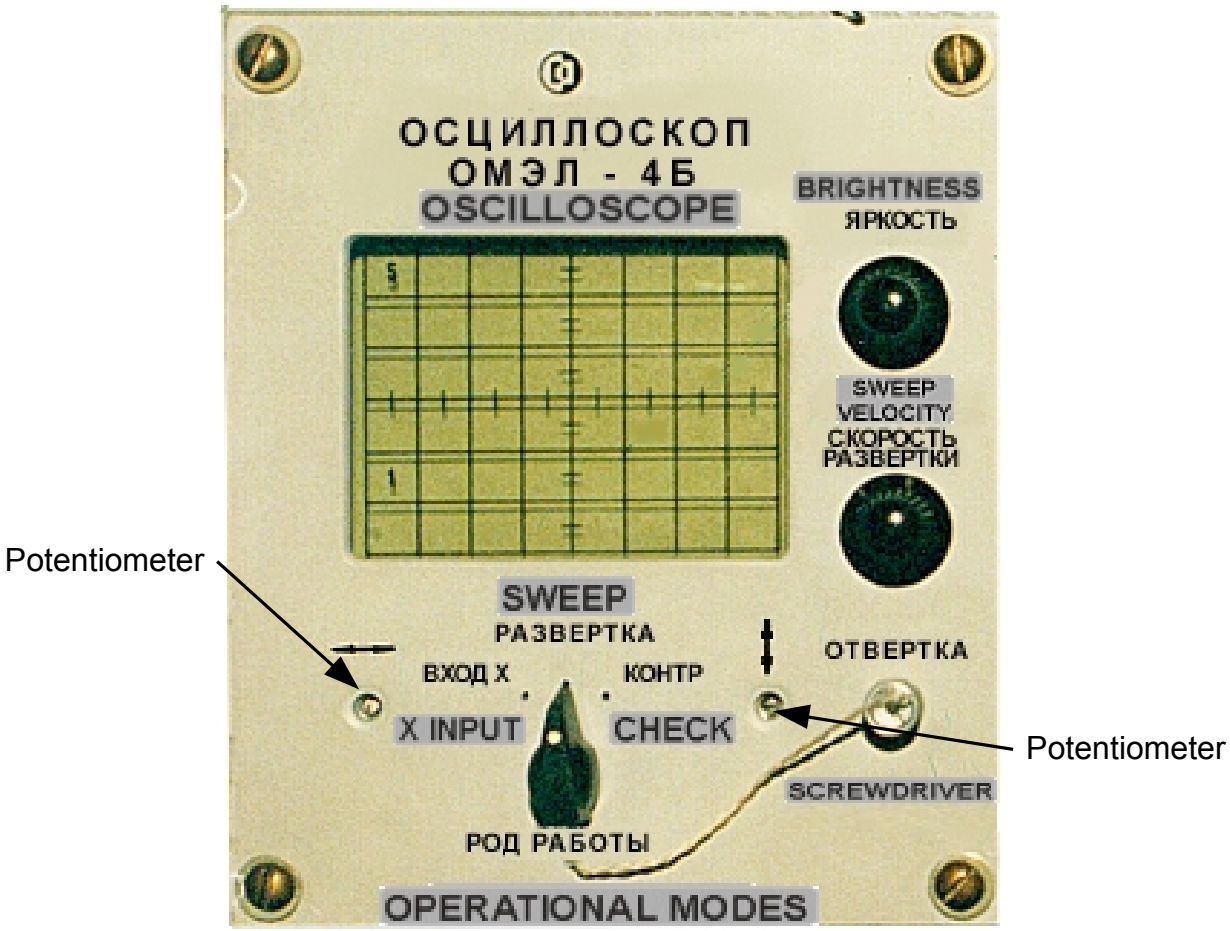


Figure 6.10 Oscilloscope Front Panel

Controls:

BRIGHTNESS	Brightness control
SWEEP VELOCITY	Sweep rate control
sw OPERATIONAL MODES	Selects type of operation
SCREWDRIVER	Potentiometer adjustment screw

6.1.5. SENSOR UNITS (УСИ) AND ACCESSORIES KITS

Purpose of Sensor Unit - Obtain physiological information

ECG Sensor Unit (УСИ ЭКГ) Purpose - Obtains ECG in 3 standard, 3 amplified and 6 chest leads

Figure 6.11 УСИ ЭКГ Sensor Unit

On the biomed harness:

Sequentially numbered openings for securing electrodes

Two pockets for standard lead electrodes marked as follows: ПРАВАЯ РУКА (Right Arm), ЛЕВАЯ РУКА и ПРАВАЯ НОГА (Left Arm and Right Leg), ЛЕВАЯ НОГА (Left Leg)

Lead cable ends in a connector, built into a casing with a two-position switch

ВАП-ККГ Sensor Unit (УСИ ВАП-ККГ) Purpose - Obtains ВАП, ККГ and ЭКГ-ДS

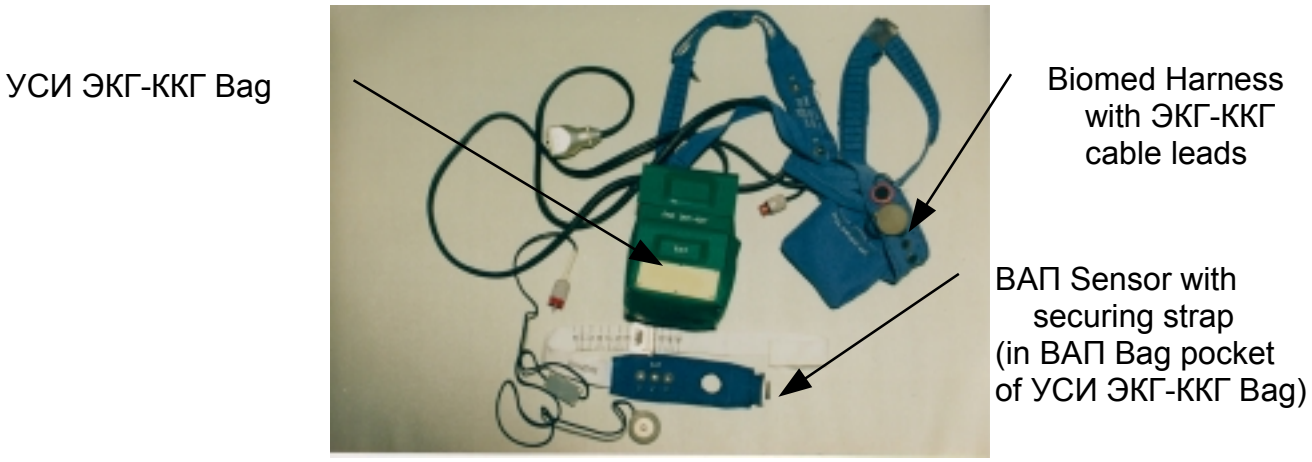


Figure 6.12 УСИ ВАП-ККГ Sensor Unit

On the biomed harness:

ECG electrodes: Д, S, 0, leads for ККГ sensor, pocket for ВПГ, ВАП, ККГ connectors

ВПГ Sensor Unit (УСИ ВПГ) Purpose - Obtain and initially convert temporal artery pulse fluctuations to electric signal

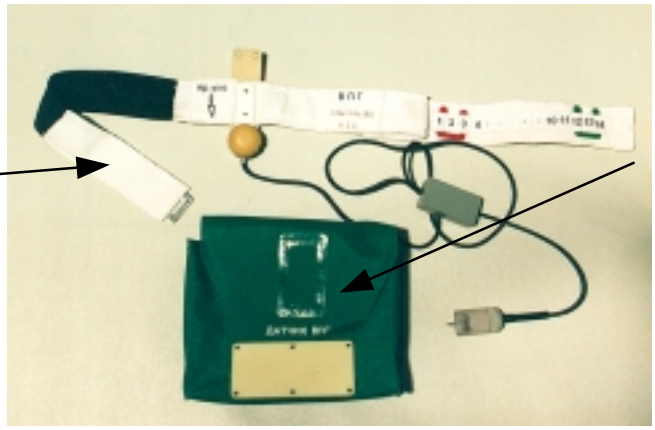


Figure 6.13 ВПГ Sensor Unit

РПГ-1 Sensor Unit (УСИ РПГ-1) Purpose - Obtain rheograms from torso

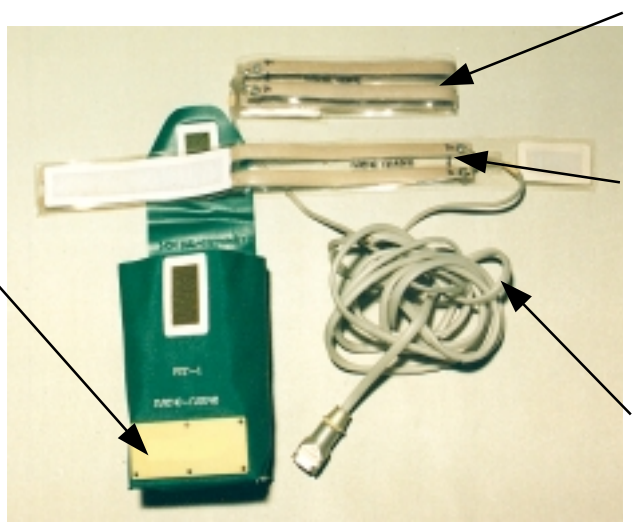


Figure 6.14 РПГ-1 Sensor unit

РПГ-2 Sensor Unit (УСИ РПГ-2) Purpose - Obtain rheograms from calf

Figure 6.15 УСИ РПГ-2

РПГ-3-01 Purpose - Obtain rheograms from liver

Figure 6.16 УСИ РПГ-3-01

Figure 6.17 РПГ-3-01 Biomed Harness (View of Electrodes)

РПГ-4 Sensor Unit (УСИ РПГ-4) Purpose - Obtain rheograms from lung

Figure 6.18 УСИ РПГ-4

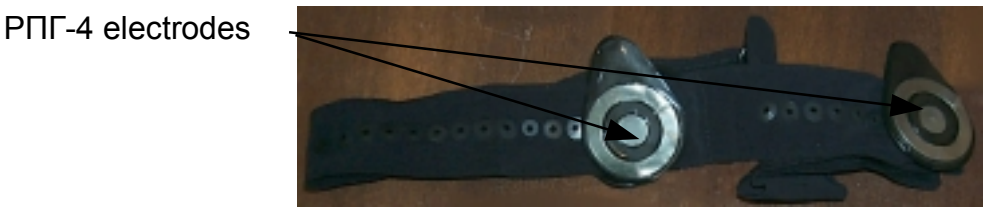


Figure 6.19 РПГ-4 Biomed Harness (View of Electrodes)

РПГ-5-01 Sensor Unit (УСИ РПГ-5-01) Purpose - Obtain rheograms from forearm

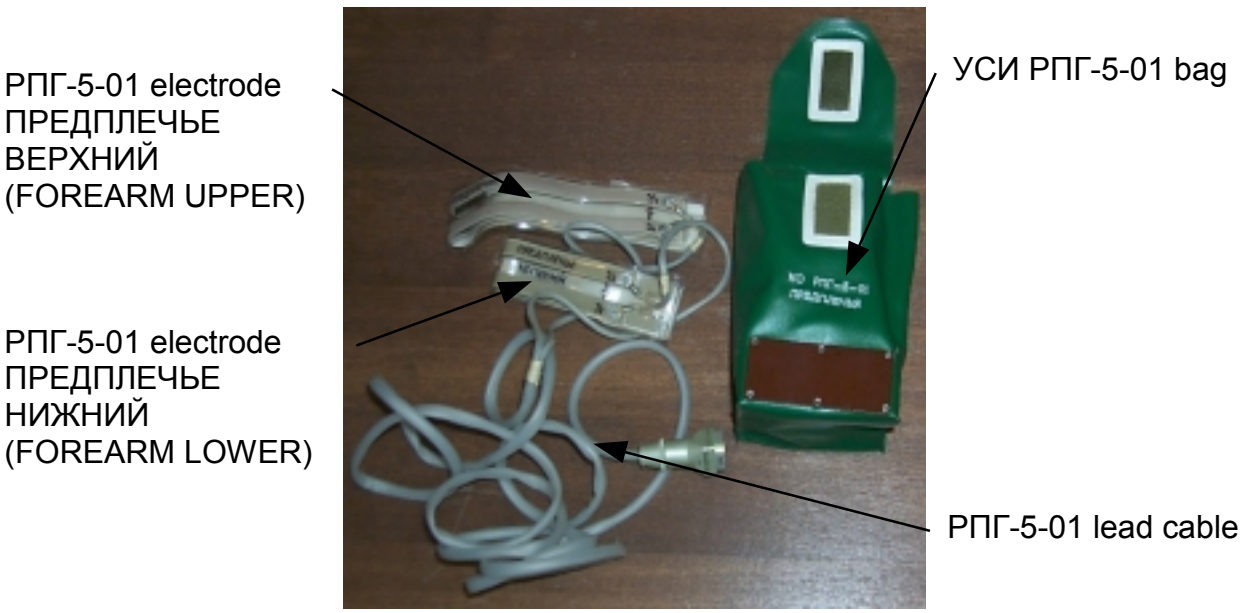

РПГ-5-01 electrode ПРЕДПЛЕЧЬЕ ВЕРХНИЙ (FOREARM UPPER)
РПГ-5-01 electrode ПРЕДПЛЕЧЬЕ НИЖНИЙ (FOREARM LOWER)
УСИ РПГ-5-01 bag
РПГ-5-01 lead cable

Figure 6.20 УСИ РПГ-5-01

РЭГ-1 Sensor Unit (УСИ РЭГ-1) Purpose:

Obtain crewmember's rheoencephalograms in the bimastoidal lead and frontomastoidal leads on the right and left

When working without КОММУТАТОР РПГ - obtain rheoencephalograms in the frontomastoidal leads

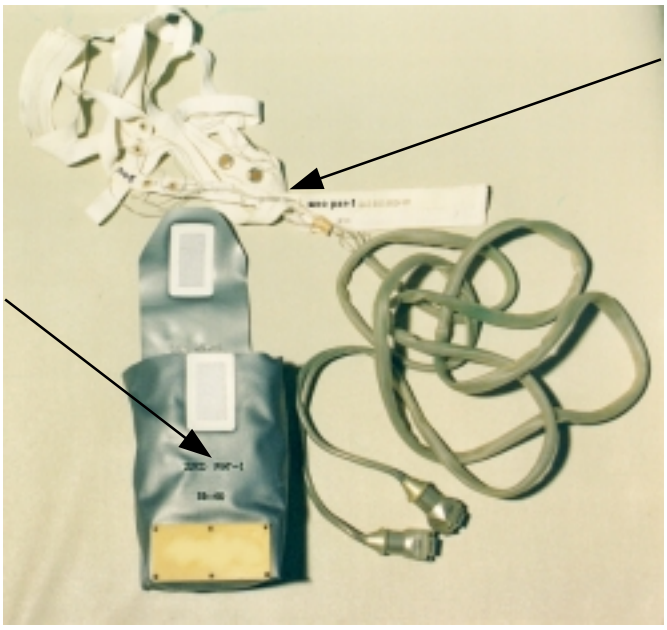


Figure 6.21 УСИ РЭГ-1

BP Sensor Unit (УСИ АД) Purpose - Obtain and perform initial conversion of TO and TK signals

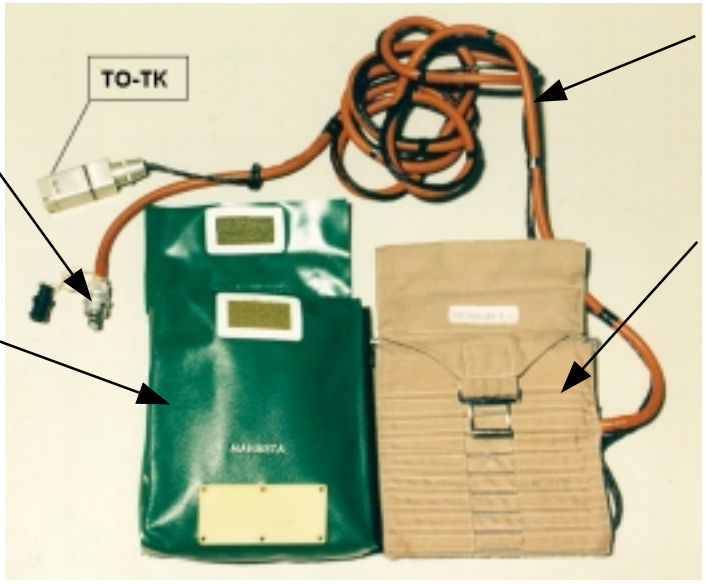


Figure 6.22 УСИ АД

УСИ ЭКГ-ОРТ Purpose - Obtain ECG in orthogonal leads per indications

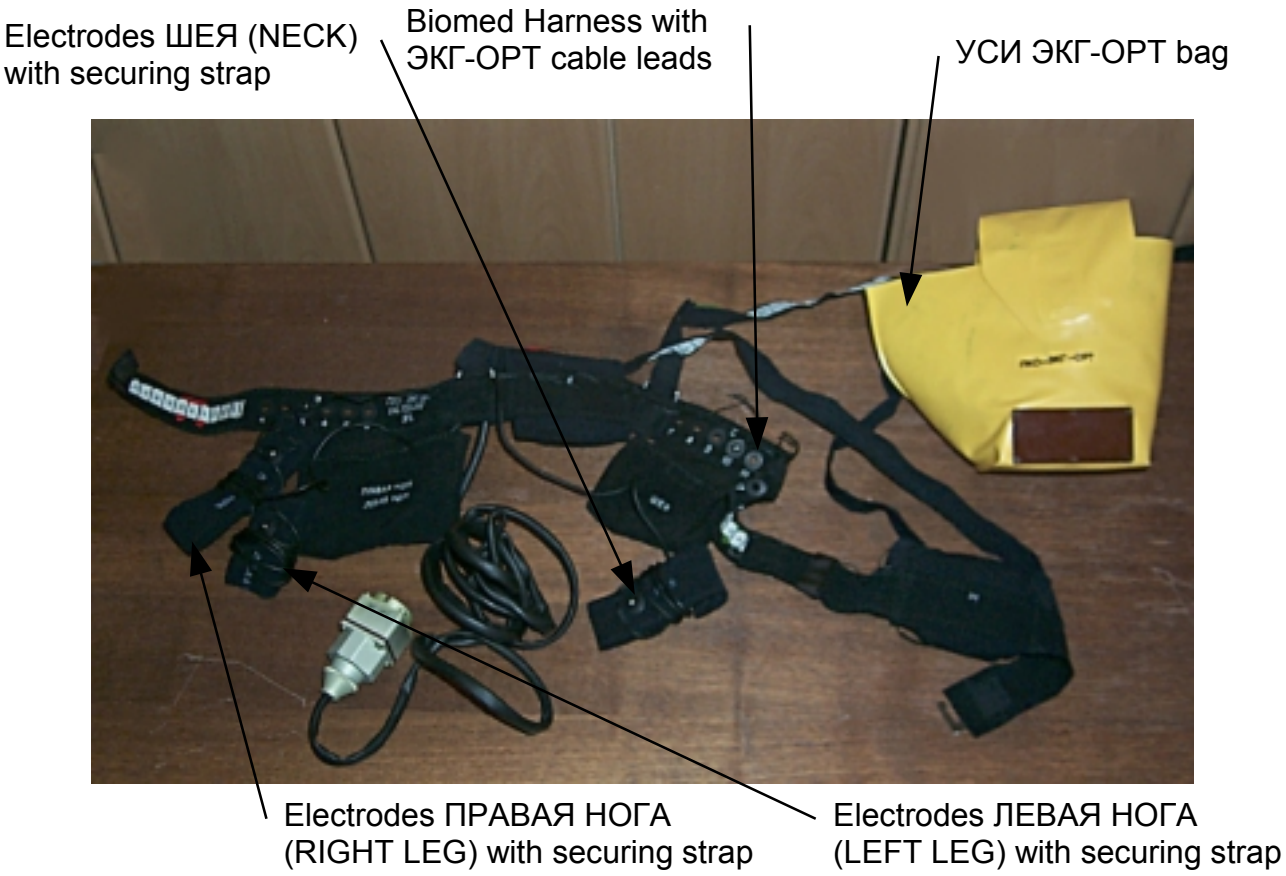

Electrodes ШЕЯ (NECK) with securing strap
Biomed Harness with ЭКГ-ОРТ cable leads
УСИ ЭКГ-ОРТ bag
Electrodes ПРАВАЯ НОГА (RIGHT LEG) with securing strap
Electrodes ЛЕВАЯ НОГА (LEFT LEG) with securing strap

Figure 6.23 УСИ ЭКГ-ОРТ

On the biomed harness:

Sequentially numbered openings for securing electrodes A, C, E, M, Y

Two pockets for electrodes marked as follows: ПРАВАЯ НОГА (Right Leg), ЛЕВАЯ НОГА и ШЕЯ (Left Leg and Neck)

Figure 6.24 Gamma-1 Set

GAMMA-1 Set Components:

Pump	for manual operating mode in the event of blood pressure panel compressor failure (attached to INFLATE socket)
Conductive fluid	tube for water (fill using Kolos system)
Adapter	for moistening ECG and ШКО-РЭГ-1 electrodes
Lube collector and feeders set	for lubricating blood pressure panel compressor blades

Set of Manuals:

Information about Subject's outfitting and waveforms of recorded signals

6.1.6. INDIVIDUAL ADJUSTMENT OF УСИ BIOMED HARNESSES

1. Adjust the length of shoulder and belt straps:
   Insert the hooks in the holes so that they are symmetrical to the spine line

Figure 6.25 Sensor unit (УСИ) Biomed Harness (Back View)

NOTE

When adjusting the length of the harness straps, the distance between the hook and clasp buckle should be 40-60 mm when unfastened.

2. Mark the holes into which the hooks are inserted using the color-coded (red or green) staples

6.1.7. REFILLING CONDUCTIVE FLUID FROM KOLOS SYSTEM

1. Unscrew cap of the tube with conductive fluid
2. Expel air from the tube by squeezing it and screw cap back on
3. KOLOS socket (with potable water) →|← tube with conductive fluid lower opening
4. Supply water (do not fill completely - without creating excessive pressure)
5. KOLOS socket ←|→ tube with conductive fluid lower opening

6.1.8. WETTING ELECTRODES

1. Remove lid from adapter
2. Untighten screw of tube with conductive fluid at 1-2 turns until it stops (to allow water from tube flow into adapter)
3. Supply water into adapter by gently squeezing the tube (traces of water should be seen on sponge)
4. Tighten screw of tube with conductive fluid
5. Press moistened sponge to electrode contact pad (do not allow water between electrode and sponge)
6. Ensure the electrode contact pad is wet
7. Cap adapter

6.1.9. LUBRICATING BLOOD PRESSURE PANEL COMPRESSOR BLADES

(after one year of blood pressure panel operation)

1. Unscrew nuts from LUBE MOTOR and LUBE COLLECTION sockets on blood pressure front panel
2. Unstow lube collector and lube feeder set from Gamma-1 set
   Detach one lube feeder from the lube feeder set
3. Screw lube collector onto LUBE COLLECTION socket
4. Power up blood pressure panel:
   connector ПКО ЭКГ-ККГ →|← EKG HARNESS connector on Medical Exam Panel
   ☝GAMMA MED SYS on ППС-24
   ☝PANEL PWR on MEDICAL EXAM PANEL PANEL PWR
    LED on BLOOD PRESSURE PANEL unit
5. Insert flat tip of lube feeder into LUBE MOTOR socket opening, and by compressing the lube feeder, pierce it with needle, located inside socket
6. Squeeze some lubricating lube out of lube feeder
7. After 20 sec power down blood pressure panel (in the reverse order)
8. Discard used lube feeder
9. Unscrew lube collector and stow it in GAMMA-1 set
10. Tighten nuts back on LUBE MOTOR and LUBE COLLECTION sockets

6.1.10. GAMMA-1M TROUBLE SHOOTING

CAUTION
If any parameter deviations were noticed, √**MCC**

	Symptom	Probable Cause	Corrective Action(s)
1.	Absense or waveform incompliance of signal from one of six parameters as displayed on Oscilloscope	Poor sensor pad contact, insufficient moistening of electrodes, sensor failure	√ correct placement of sensor or electrode Moisten electrode pads ↓ pb ATTENUATION (on MEDICAL EXAM PANEL) No signal: Replace biomed harness (ПКО) No signal: √**MCC**
2.	After pressing pb START on blood pressure panel, cuff pressure doest not change	Compressor pump failure, protective circuit failure	Go to manual mode of operation: sw MODE on BLOOD PRESSURE PANEL → MANUAL Pump →|← INFLATE fitting Pressurize until □ LED MANUAL ↓ pb START
3.	Pressurization rate in CUFF in PRESSURE WAVE FORM mode is changing	Choke СКОРОСТЬ КОМПРЕССИИ (pressurization rate) adjustment was disrupted	Remove blood pressure panel from medical locker Remove seal from choke СКОРОСТЬ КОМПРЕССИИ (on the left wall) Adujst choke to required pressurization rate (decrease pressurization rate — when screwing choke in, increase — when screwing choke out)
4.	Depressurization rate in CUFF in KOROTKOV SOUND mode is changing	Choke СКОРОСТЬ ДЕКОМПРЕССИИ (depressurization rate) adjustment was disrupted	Remove blood pressure panel from medical locker Remove seal from choke СКОРОСТЬ ДЕКОМПРЕССИИ (on the left wall) Adujst choke to required depressurization rate (decrease depressurization rate — when screwing choke in, increase — when screwing choke out)

6.2. MASS MEASUREMENT DEVICE (ИМ)

Purpose:

To measure body mass and small mass in a microgravity, and to display the data on digital readout

Principle of Operation:

Measurement of system's free oscillations attenuation rate

Specifications:

Mass measurement range:

Body mass measurement mode	50.00 – 99.99 (± 0.25) kg
Small mass measurement mode within sub-ranges	0.02 – 0.2 (± 0.02) kg
	0.2 – 2.0 (± 0.04) kg

Power consumption:

Power consumption from onboard power source	no more than 50 W
ИМ stand movable part mass	7.0 kg
Number of oscillations till complete stop	not less than 30
Electromagnetic attraction force applied to ИМ stand	not less than 150 N
Build-up time	5 min
Continuous operating time	8 hours

Hardware Components:

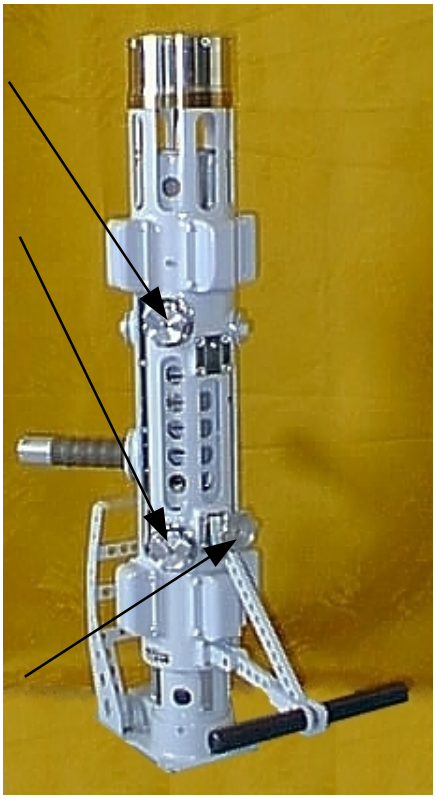
ИМ Stand (Figure 6.26 p. 6-23)
ИММ Kit (Figure 6.27 p. 6-23)
Matching Unit (УС) (Figure 6.28 p. 6-24)
MASS MEASUREMENT PANEL (УСВ) (Figure 6.28 p. 6-24)
Cable kit (Figure 6.29 p. 6-24)
- cable 5A4.856.237 (pocket 'КАБЕЛЬ №1')
- cable 5A4.856.238 (pocket 'КАБЕЛЬ №4')
- cable 5A4.856.253 (pocket 'КАБЕЛЬ №3')
- cable 5A4.856.254 (pocket 'КАБЕЛЬ №2')

Platform (Figure 6.30 p. 6-24)
Cover (Figure 6.31 p. 6-25)

Location:

ИМ Stand, ИММ Kit, cable kit, platform	In panel 115 area
MASS MEASUREMENT PANEL (УСВ)	On panel 120
Matching Unit (УС)	Under panel 121

Front View



Back View (footbar is lowered)

Figure 6.26 ИМ Stand

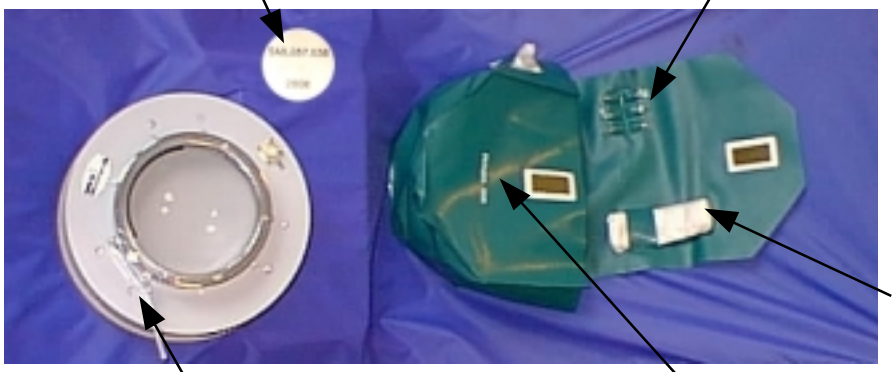


Figure 6.27 ИММ Kit

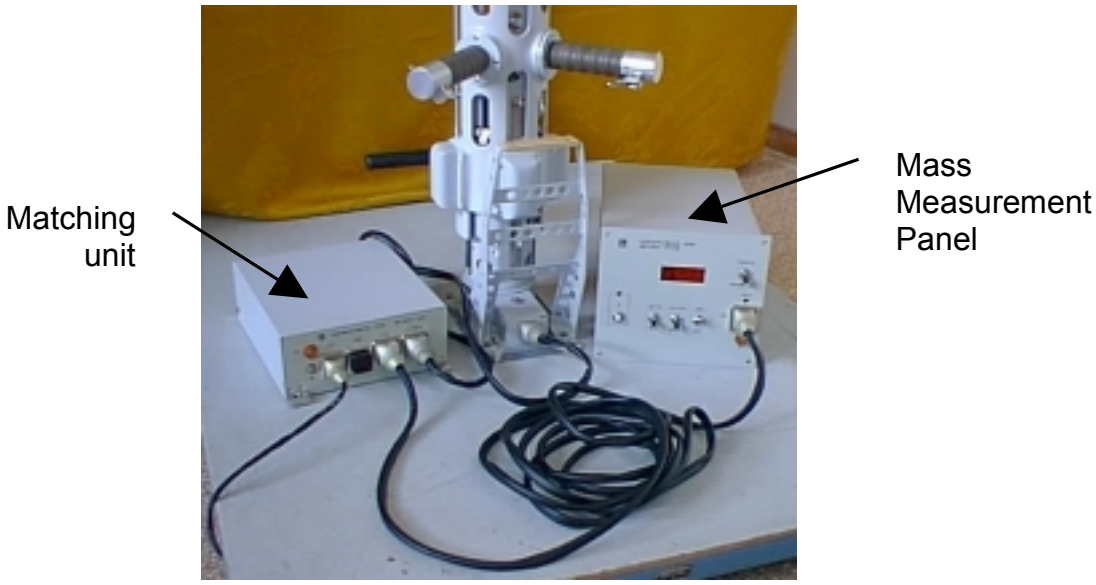


Figure 6.28 Matching Unit (YC) and Mass Measurement Panel (YCB)

Figure 6.29 Kit with Cables

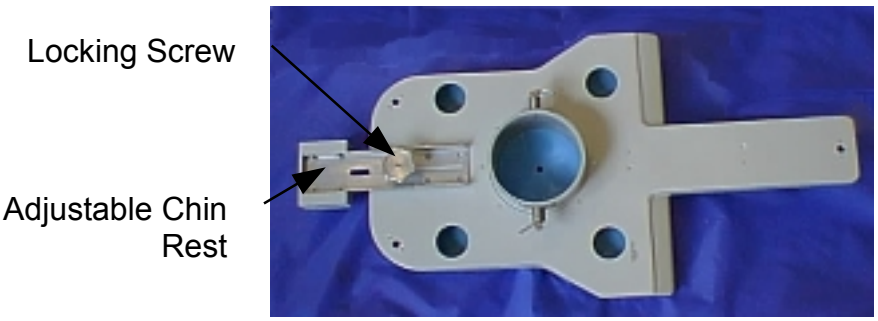


Figure 6.30 Platform (Bottom View)

Figure 6.31 Mass Measurement Device in Stowed Configuration

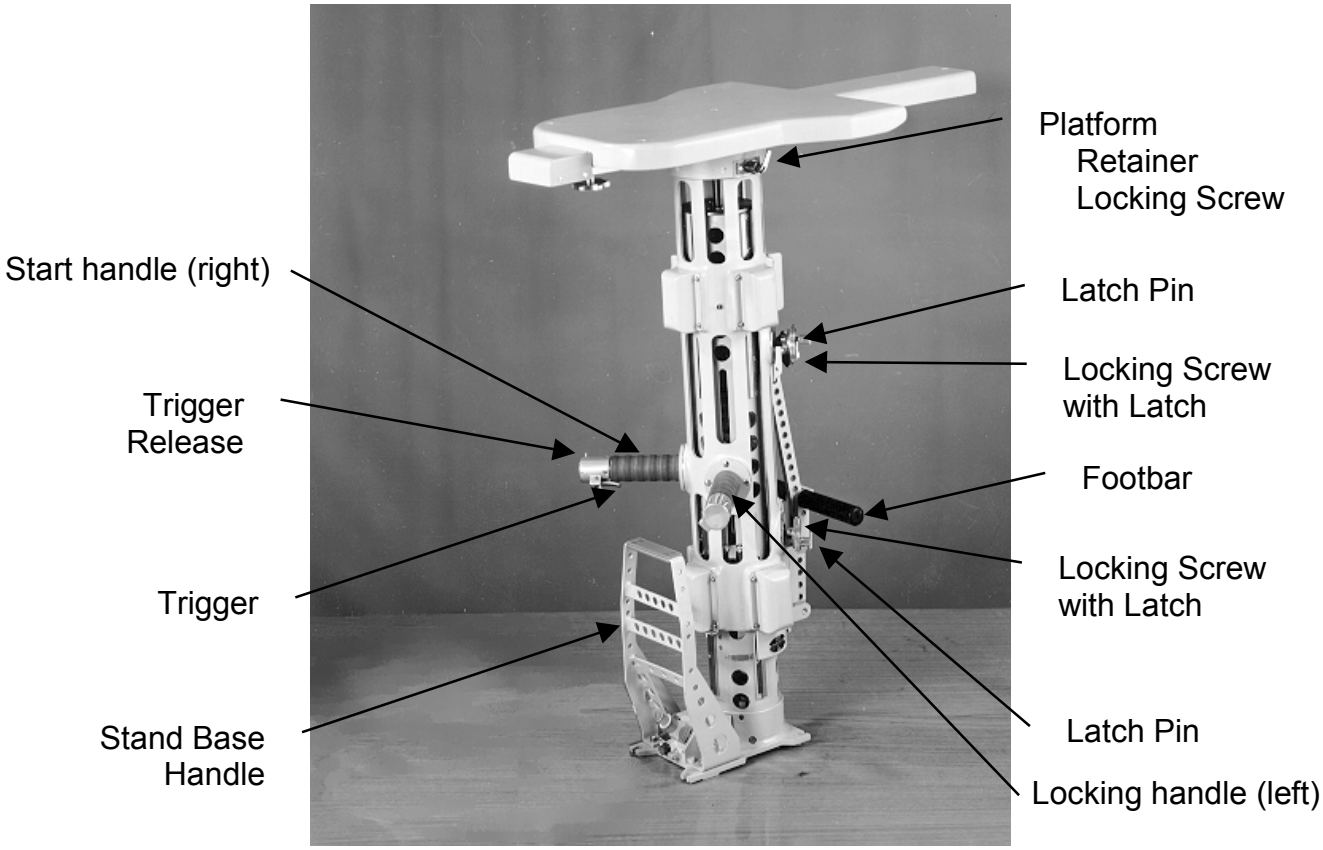


Figure 6.32 Mass Measurement Device (ИМ) in
Body Mass Measurement (ИМТ) Configuration

6.2.1. INTEGRATED INERTIAL CONVERTER UNIT (ПКИ) INITIAL SETUP

CAUTION
Do not allow any inertial mass impact with the unit to prevent the damage to its precision mechanism

1. Unstow ПКИ

Figure 6.33 ПКИ ИМ with installed transport cover

2. Remove screws pos.1-3 (by performing alternate half-turns) (Figure 6.34 p. 6-26) on ПКИ transport cover

3. Remove screws pos. 4-6 (by performing alternate half-turns) (Figure 6.34 p. 6-26) on ПКИ transport cover

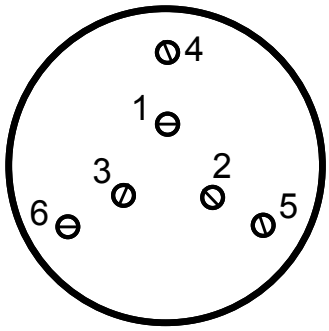


Figure 6.34 ПКИ transport cover screws location

4. Remove transport cover from ПКИ (see Figure 6.35 p. 6-27)

5. Discard transport cover and screws

6. Stow ПКИ

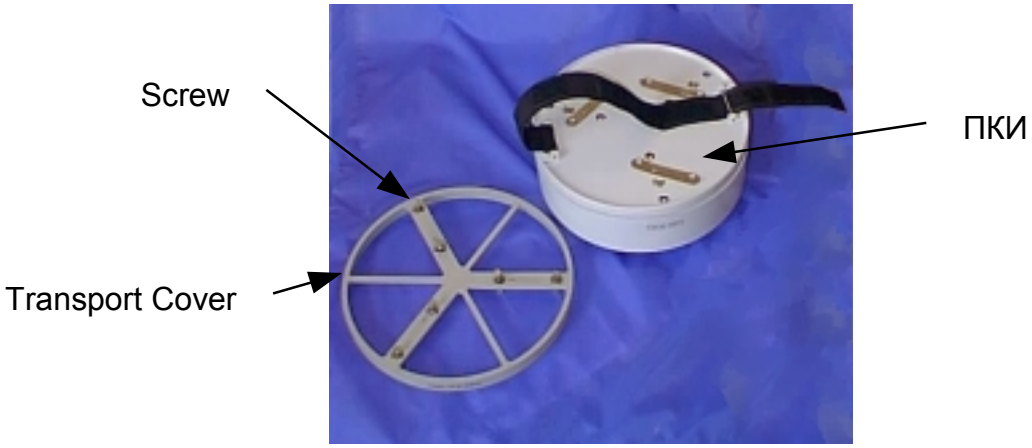


Figure 6.35 ПКИ with removed transport cover

Figure 6.36 Mass Measurement Device (ИМ)
in Small Mass Measurement (ИММ) Configuration

Figure 6.37 Matching Unit (УС) Front Panel

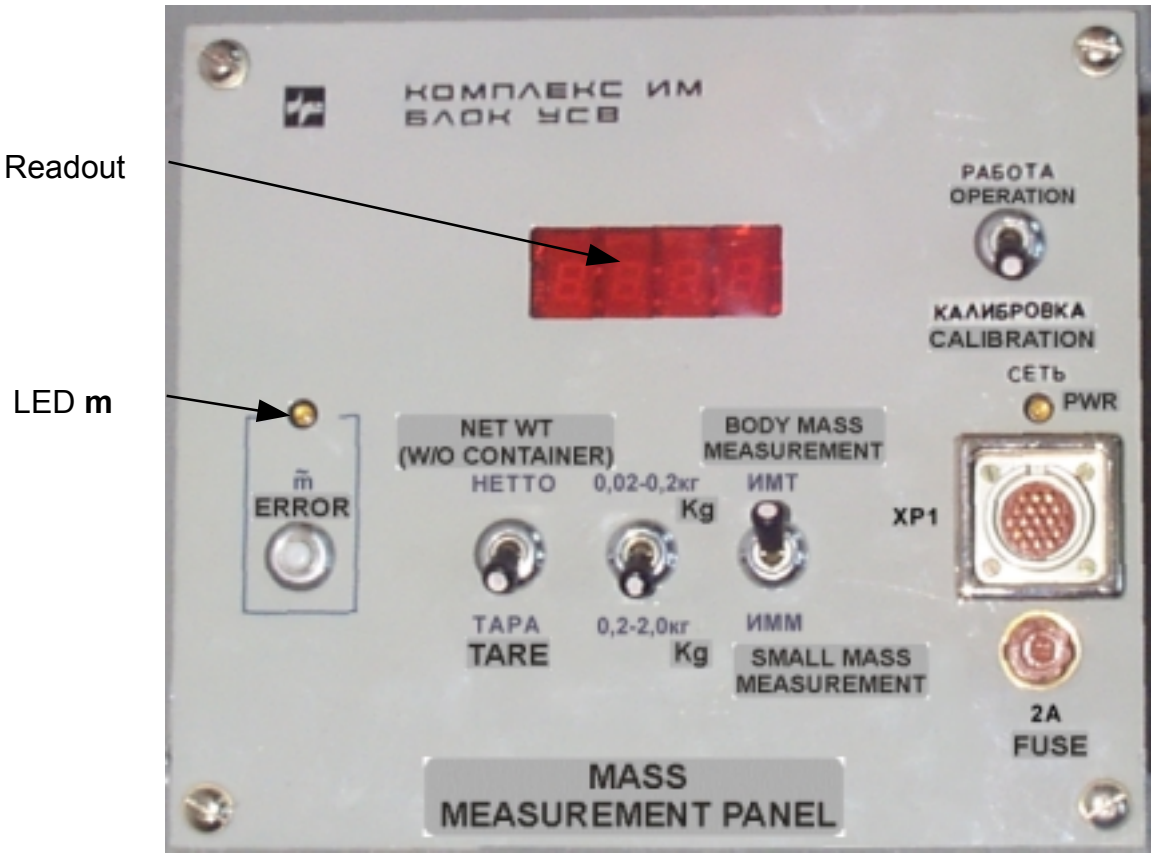


Figure 6.38 Mass Measurement Panel (УСВ) Front Panel

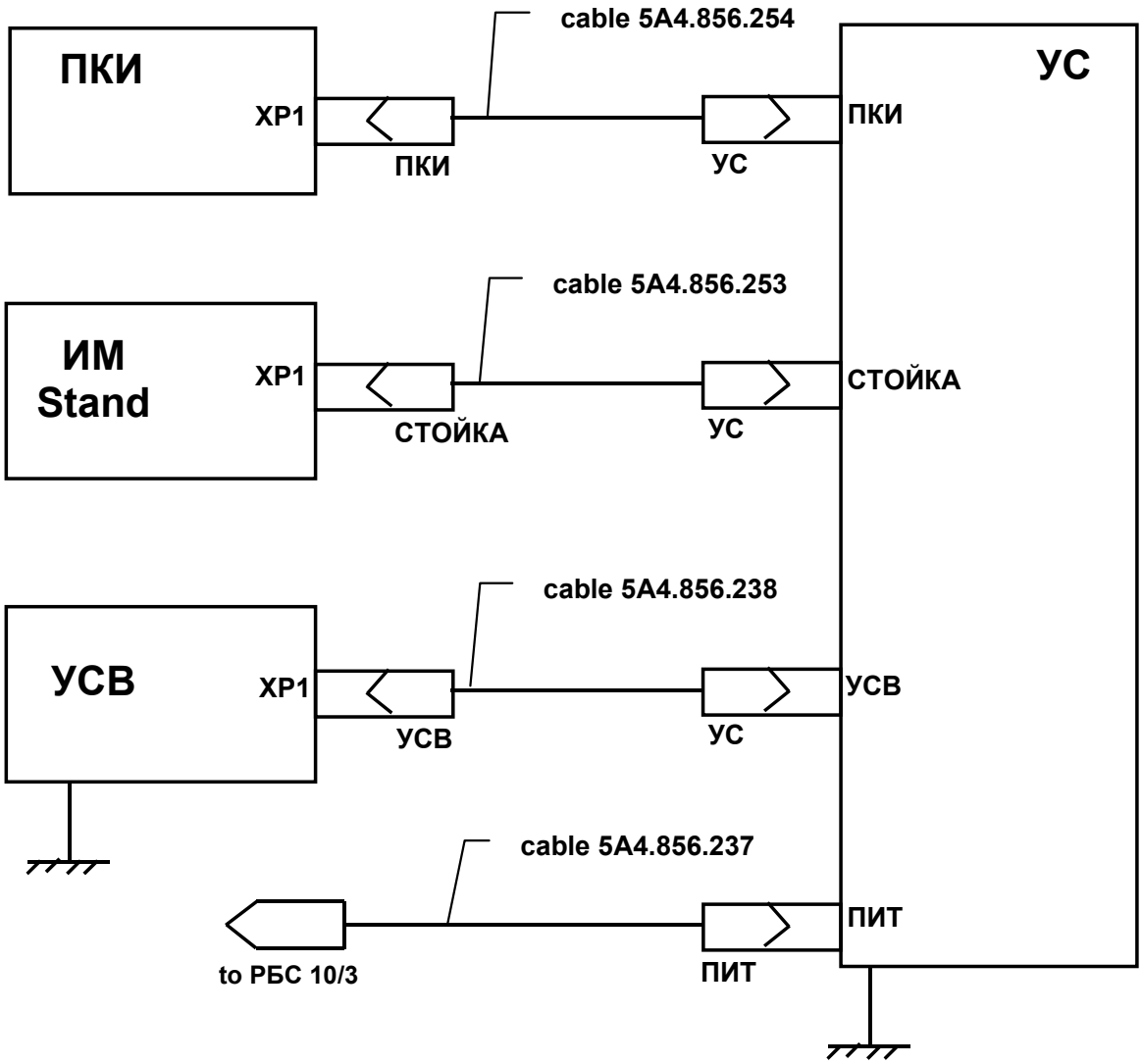


Figure 6.39 Mass Measurement Device (ИМ) Electrical Connection Diagram

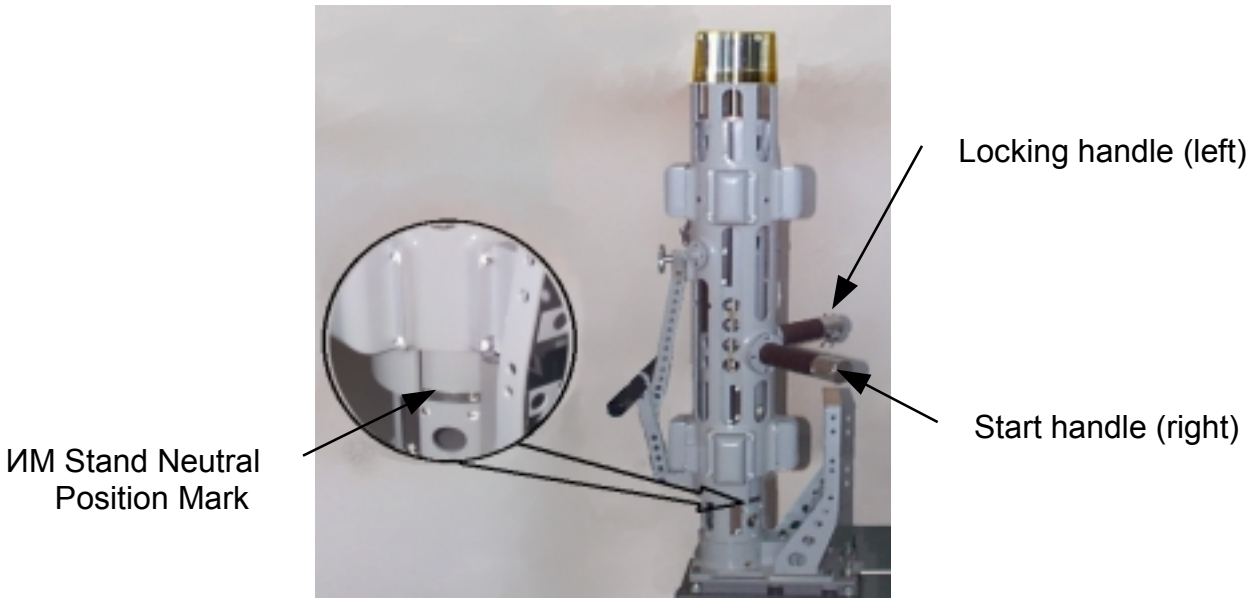


Figure 6.40 ИМ Stand in Working Configuration (movable part is secured in neutral position)

6.2.2. ИМ CONFIGURATION FOR SMALL MASS MEASUREMENT (ИММ) MODE

1. Remove platform from ИМ stand:
   Loosen platform locking screw
   Remove platform
   Temp stow platform

2. Unstow ИМ stand and ПКИ
   Install ИМ stand into working configuration (Figure 6.40 p.6-29)

3. Remove cover from ИМ stand
   Temp stow cover

4. Unsecure latches of two locking screws with latches on ИМ stand (see Figure 6.26 p. 6-23, Figure 6.32 p. 6-25)
   Remove locking screws with latches (two)

5. Determine number of oscillations till the complete stop:
   Depress handle triggers
   Bring instrument movable part toward its base to the stop and then quickly let it go
   Count number of oscillation cycles till the complete stop
   If <30, clean the inner tube guides with wipe from ИММ Kit **********

   * ********** *
   If number of oscillations <30:
   Repeat Step 5
   If number of oscillations still <30
   see Sect.6.2.5 Step 2 p. 6-36)
   * ********** *

6. Set the movable part of ИМ stand in neutral position (see Figure 6.40 p. 6-29)
   ↧ trigger releases of locking handle (left)
   Tighten two locking screws with latches (see Figure 6.26 p. 6-23, Figure 6.32 p. 6-25)
   Engage latches of locking screws with latches (two) on ИМ stand

7. Install ПКИ onto ИМ stand:
   Loosen ПКИ lever clamp
   Put ПКИ on movable tube of ИМ stand
   Secure ПКИ on ИМ stand, by turning the lever clamp ↷

8. Unstow cable from kit with cables
   Configure circuit per Figure 6.39 p. 6-29
   √ cable 5A4.856.254 does not preclude free movement of ИМ stand movable part

УСВ unit 9. ☟ИММ (Figure 6.38 p. 6-28)

10. cnctr X2 of cable 5А4.856.237 →|← РБС 10/3 power outlet
☟РБС 10/3

УСВ unit 11. □ PWR LED (Figure 6.38 p. 6-28)
УСВ readout □ 0000

* ********** ,
If ■ PWR LED or MASS MEASUREMENT PANEL readout perform Sect.6.2.5 Step 1 p. 6-36
If □ two-digit number on MASS MEASUREMENT PANEL readout perform Sect.6.2.5 Step 3 p. 6-36
* ********** ,

12. Disengage latches of two locking screws with latches on ИМ stand (see Figure 6.26 p. 6-23, Figure 6.32 p. 6-25)
Loosen two locking screws with latches

13. Pause for 5 min

6.2.3. SMALL MASS MEASUREMENT

6.2.3.1. DEVICE CALIBRATION AND CALIBRATION CHECK

NOTE

1. Calibration is performed every time when switched from one measurement sub-range to another
2. Calibration is performed during prolonged operations (over 30 min) in the same measurement sub-range

CALIBRATION

УСВ unit 1. ☟CALIBRATION
☟ 0.2-2.0
☟ NET WT

2. ↓ trigger of ИМ stand locking handle (left)
↓ trigger releases of start handle (right)
Bring instrument movable part toward its base to the stop

ИМ stand 3. ↓ trigger of start handle (right)
УСВ unit ■ MASS MEASUREMENT PANEL readout
ИМ stand ◅ movable part oscillations (after 3 sec)

УСВ readout 4. □ calibration coefficient value

5. Repeat steps 2-4 three more times

УСВ unit 6. ↓ pb **m** □ LED **m** (Figure 6.38 p. 6-28)
УСВ readout □ average value of calibration coefficient

УСВ unit 7. ☝ OPERATION

8. Set the movable part of ИМ stand in neutral position
↓ trigger releases of locking handle (left)

CALIBRATION CHECK

9. Unstow reference weight from ИММ Kit
Place reference weight on ПКИ platform
Secure reference weight via Velcro

10. ↓ trigger of ИМ stand locking handle (left)
↓ trigger releases of start handle (right)
Bring instrument movable part toward its base to the stop

ИМ stand 11. ↓ trigger of start handle (right)
УСВ unit ■ MASS MEASUREMENT PANEL readout
ИМ stand ◅ movable part oscillations (after 3 sec)

УСВ readout 12. □ value of reference weight mass

13. Repeat steps 10-12 two more times

УСВ unit 14. ↓ pb **m** □ LED **m** (Figure 6.38 p. 6-28)
УСВ readout □ average value of reference weight mass

15. ◅ difference between average value of reference weight mass and actual reference weight mass value stays within ± 0.005 kg
If values are different for more than ± 0.005 kg, repeat calibration sequence and calibration check

16. Set the movable part of ИМ stand in neutral position
↓ trigger releases of locking handle (left)

17. Remove reference weight from ПКИ platform
Stow reference weight into ИММ kit

6.2.3.2. SMALL MASS MEASUREMENT

1. √ ИМ stand movable part is secured in neutral position
Place item to be weighed on ПКИ platform
Secure item with Velcro

2. ↓ trigger of ИМ stand locking handle (left)
   ↓ trigger releases of start handle (right)
   Bring instrument movable part toward its base to the stop

ИМ stand 3. ↓ trigger of start handle (right)
УСВ unit ■ MASS MEASUREMENT PANEL readout
ИМ stand ◅ movable part oscillations (after 3 sec)

УСВ readout 4. □ item mass

5. Repeat steps 2-4 three more times

УСВ unit 6. ↓ pb **m** □ LED **m** (Figure 6.38 p. 6-28)
УСВ readout □ average value of item mass

7. Record data in the log sheet (see pp. 6-37, 6-38)

8. Set the movable part of ИМ stand in neutral position
   ↓ trigger releases of locking handle (left)
   Remove weighed item from ПКИ platform

6.2.3.3. SMALL MASS (UP TO 0.2 KG) MEASUREMENT

УСВ unit 1. CALIBRATION
   0.2-2.0
   NET WT

2. Perform calibration and calibration check per Sect. 6.2.3.1 steps 2-15 pp. 6-31 - 6-32

3. Perform required item mass measurement per Sect. 6.2.3.2 steps 1-6 pp. 6-32 - 6-33

4. Record data in the log sheet (see pp. 6-37, 6-38)

5. Set the movable part of ИМ stand in neutral position
   ↓ trigger releases of locking handle (left)
   Remove weighed item from ПКИ platform

6.2.3.4. SMALL MASS MEASUREMENT USING ADDITIONAL PACKING (CONTAINER)

УСВ unit

1. ☞CALIBRATION
   ☞ 0.2-2.0
   ☞ NET WT

2. Perform calibration and calibration check per Sect. 6.2.3.1 steps 2-15 pp. 6-31 - 6-32

3. √ИМ stand movable part is secured in neutral position
   Place container on ПКИ platform
   Secure container with Velcro

УСВ unit

4. ☞CALIBRATION
   ☞ NET WT
   Perform container mass measurement per Sect. 6.2.3.2 steps 2-6 p. 6-33

5. Set ИМ stand movable part in neutral position
   ↓ trigger releases of locking handle (left)
   Place item to be weighed into container

6. ☞OPERATION
   Perform mass measurement per Sect. 6.2.3.2 steps 2-6 p. 6-33

7. Record data in the log sheet (see pp. 6-37, 6-38)

8. Set ИМ stand movable part in neutral position
   ↓ trigger releases of locking handle (left)
   Remove weighed item and container from ПКИ platform

6.2.4. CLOSEOUT OPERATIONS AFTER COMPLETION OF SMALL MASS MEASUREMENT

1. ⚲ РБС 10/3

УСВ unit

■ LED POWER (Figure 6.38 p. 6-28)
connector X2 of cable 5A4.856.237 ↔ РБС 10/3 power outlet
Disconnect cables per Figure 6.39 p. 6-29
Stow cables in cable kit

2. √ ИМ stand movable part is secured in neutral position
Tighten two locking screws with latches
Engage latches of two locking screws with latches on ИМ stand

3. Remove ПКИ from ИМ stand:
Rotate ПКИ lever clamp ↶
Remove ПКИ from movable metal tube of ИМ stand
Stow ПКИ

4. Put cover on ИМ stand (labeling on the right)

5. Stow ИМ stand
Stow platform onto ИМ stand and secure by tightening locking screw

6.2.5. TROUBLE SHOOTING

	Symptom	Corrective Action(s)
1.	When connecting X2 cnctr to РБС power outlet ■ MASS MEASUREMENT PANEL readout and ■ LED PWR	Check good connector contact in ИМ stand, MASS MEASUREMENT PANEL, matching unit and РБС power outlet Check □ or ■ green LED on РБС power outlet If ■ green LED replace fuse of РБС power outlet If all connections are found OK, replace fuses (spare fuses can be found inside inner pockets of ИММ кit)
2.	Number of ИМ stand movable part free oscillations < 30	Wipe ИМ stand guides using a dry napkin from ИММ kit Measure number of free oscillations (see Sect. 6.2.2 Step оп 5 p. 6-30) If the number of free oscillations is < 30: Stop measurements √**МСС**
3.	Two-digit on MASS MEASUREMENT PANEL readout is lit (e.g. 01, 02 or 03)	Deenergize hardware Activate hardware Perform calibration, calibration check and measurements per this procedure

Log Sheet

Date	Item	Measured Mass

Log Sheet

Date	Item	Measured Mass

6.3. SPHYGMOMANOMETER TENSOPLUS

Purpose:

To measure BP (blood pressure) and PR (pulse rate)

Hardware Components:

TENSOPLUS OSZ-2 instrument;
cuff;
batteries set;
case

Range of measurement:

systolic pressure - 50-280 mm Hg
diastolic pressure - 40-160 mm Hg
Pulse rate measurement range: 35-160 bpm

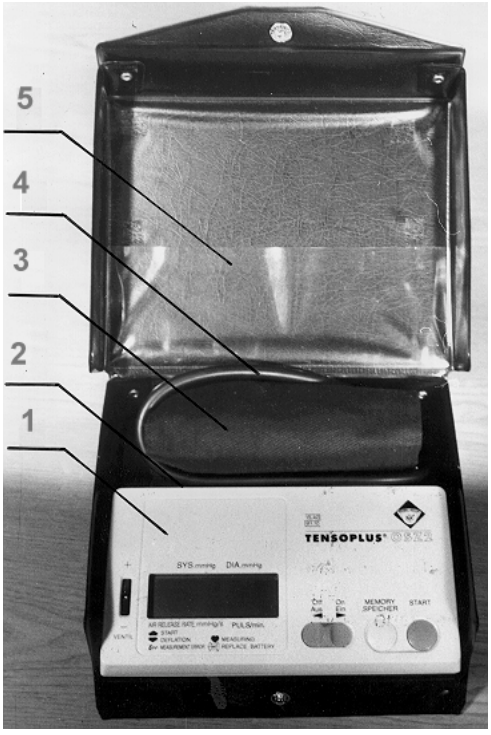
Power source:

6 V, LR6 or R6 type batteries (4 ea.)

Location – medical locker, container 2

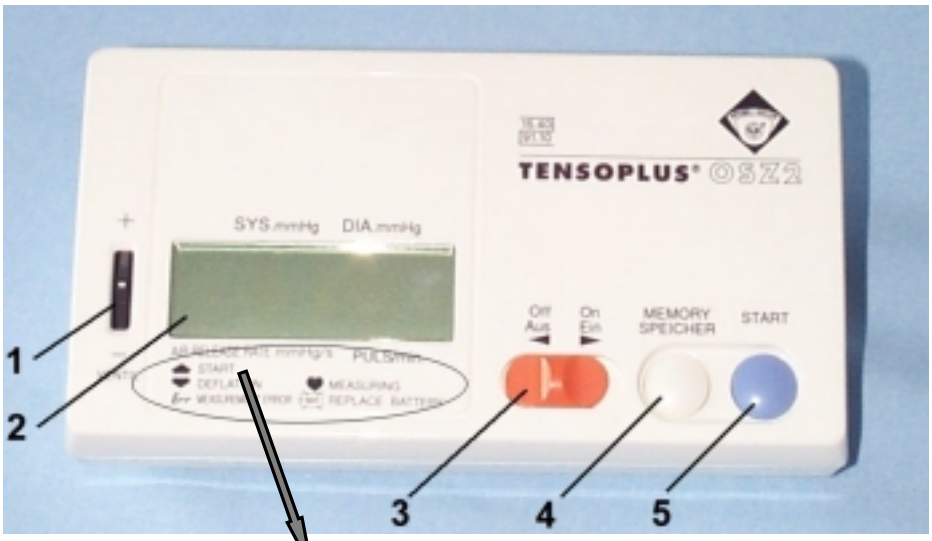
Principle of operation is based on the method of tensometric measurement of blood pressure during brachial artery decompression using pneumocuff and built-in sphygmomanometer pump

Provided compression thresholds - 190, 220, 250, 270, 300 mmHg, chosen automatically depending on specific value of measured systolic pressure



1 – TENSOPLUS OSZ-2 instrument,
2 – air connector,
3 – cuff,
4 – rubber hose,
5 – case

Figure 6.41 Sphygmomanometer (General View)



Information display:

Start – Start of BP and pulse measurement

Deflation – pressure equalization mode

Err **Measurement Error** – measurement error

Measuring – BP and pulse measurement mode

bat **Replace battery** – replace battery

Figure 6.42 TENSOPLUS OSZ - 2 Front panel

1 - controller VENTIL
2 - light display
3 - switch OFF-ON
4 - button MEMORY
5 - button START

Controls and Indicators:

Switch OFF-ON	powers the instrument on and off
Button START	activates BP and PR measurement mode
Light display	displays instrument operating mode information, systolic and diastolic pressure measurement data (mmHg), and pulse (bpm)
Button MEMORY	displays up to 7 most recent measured BP values, stored in memory buffer
VENTIL Control	adjusts decompression rate
Pressure inlet МАНЖЕТА (Cuff)	to mate with cuff pneumoconnector
Connector ПИТАНИЕ (Power)	supplies instrument with 6V power from external DC power source (located on the instrument back wall, not used in flight)

6.3.1. BATTERY REPLACEMENT

INSTALL (if required) battery set into battery compartment

1. Remove sphygmomanometer from the case and open battery compartment lid

2. Remove battery set from case and packet and install it into battery compartment following polarity marks

3. Cl battery compartment lid

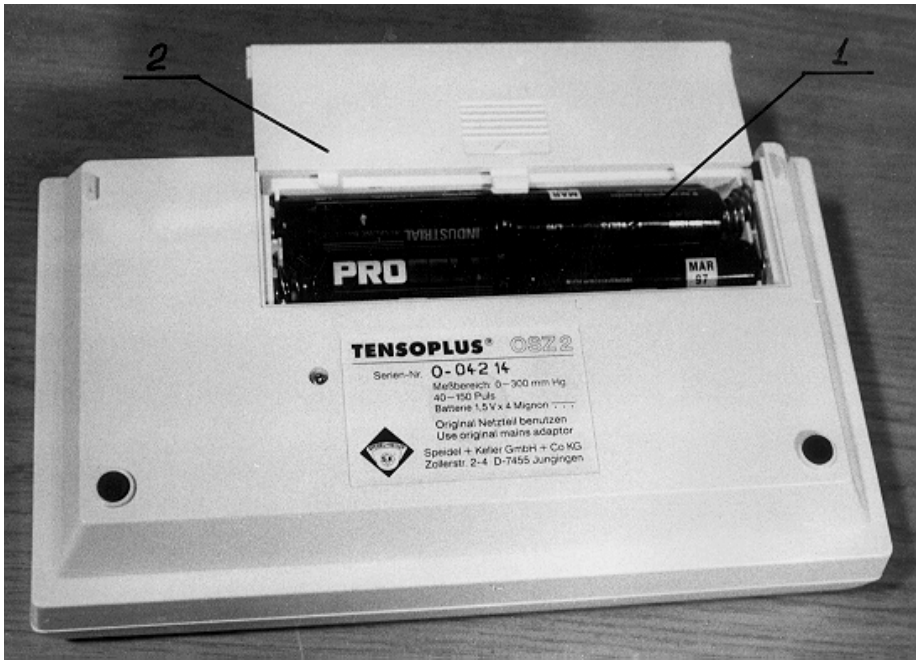


Figure 6.43 TENSOPLUS OSZ – 2 — Base

1 – battery compartment
2 – lid

6.4. COMPLEX CENTER

Purpose:

Power supply for devices intended for performing full-scale medical and biological experiments

Galvanic isolation of two external analog signals, in the range from 0 to + 6 V and their output to telemetry systems

Measurement and digital indication of interelectrode resistance and DC voltage

Sequential display of signals from peripheral devices on the oscilloscope screen

Hardware Components:

Oscilloscope ОМЭЛ-4Б

Power supply unit (БП)

(Center) Connector Check (БКК)

МЭК-2 set

Location:

SM medical locker

Specifications:

Power consumption by the complex components, not more than:

power supply unit	135 W (max)
(Center) Connector Check (БКК)	7 W
oscilloscope	7 W

Time for transition into operating mode for the complex components should not exceed 5 min

Electrical power for complex CENTER is supplied from ППС-24

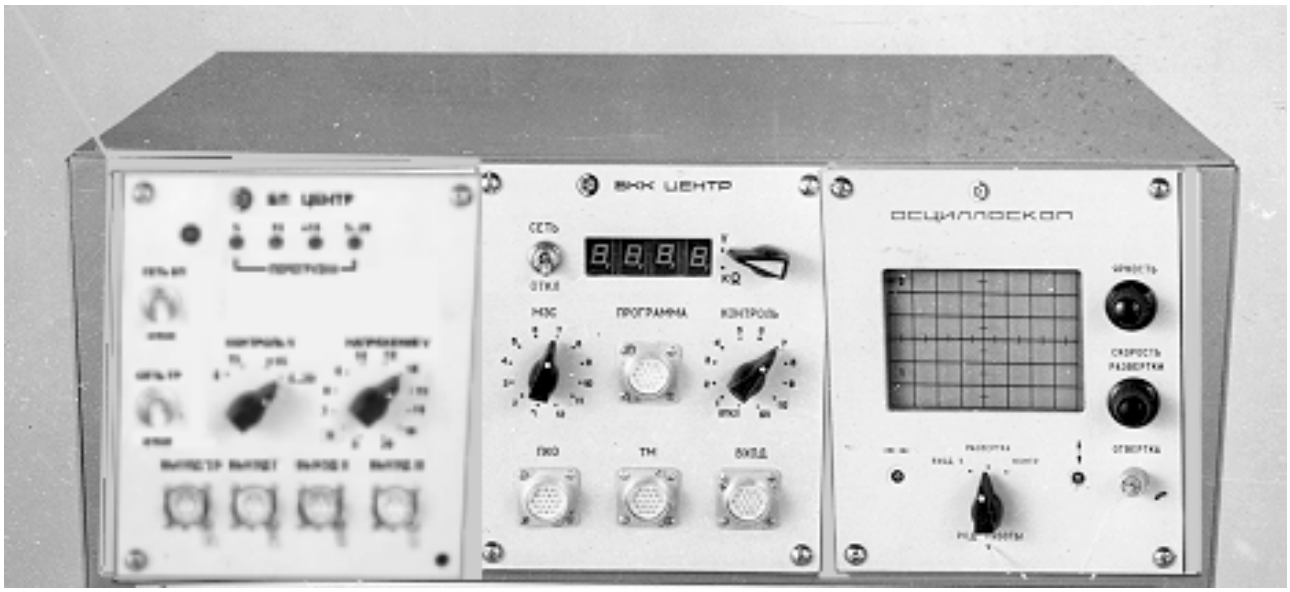


Figure 6.44 Complex Center

CENTER POWER UNIT provides:

Power supply of peripheral devices via connectors OUTPUT I, OUTPUT II, OUTPUT III (parameters of output voltages are given in Table 6.2 p. 6-45)

Power supply of peripheral devices via connector ВЫХОД ТР (transformer output) at 27 V, supplied to the connector from feed circuit without intermediate conversions via 5 A fuse

Transfer of feed circuit voltages (27 V) to CENTER CONNECTOR CHECK via connector PANEL PWR

Transfer of output voltages (5, 15, minus 15 V and 5…20 V) to CENTER CONNECTOR CHECK digital volt-ohmmeter input via connector CHECK

Continuous operation time of the unit – 8 hours

In the event of short circuit of any unit output (except ВЫХОД ТР) or boost of load current to 1.5 and 4 A, respectively, circuit protection device is triggered, thus limiting the given channel output current, and corresponding LED OVERLOAD lights up

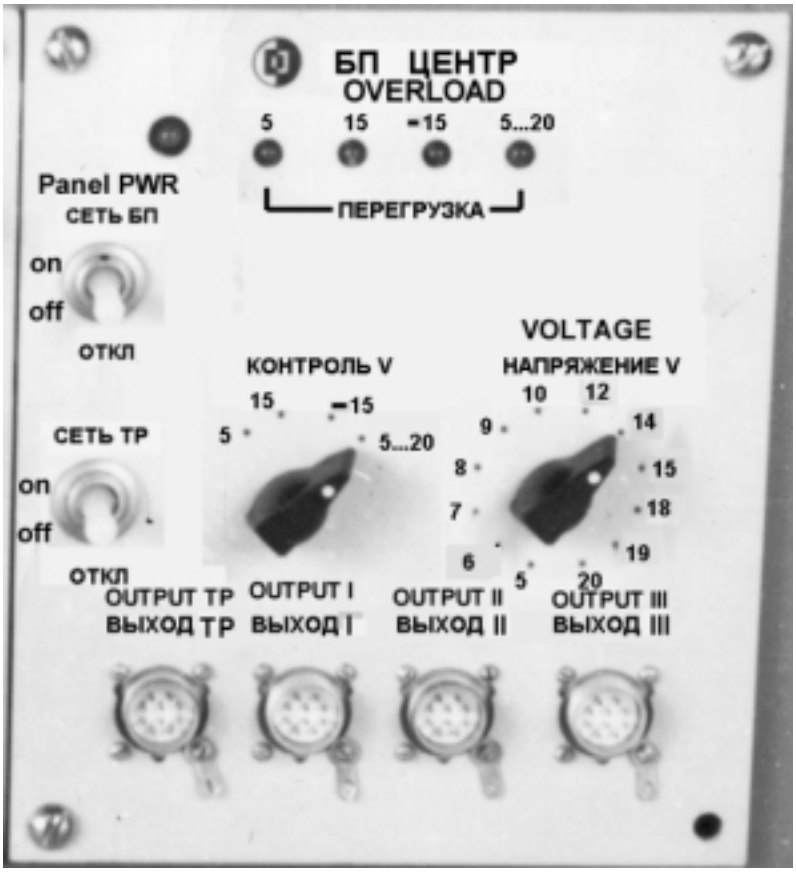


Figure 6.45 Front panel of CENTER POWER UNIT

CENTER POWER UNIT Controls:

Front Panel

sw CHECK V	For consecutive control of output voltages on digital volt-ohmmeter
sw VOLTAGE V	For discrete set of voltages 5…20 V
sw PANEL PWR	For unit activation
sw TRANSFORMER POWER	For transit circuit activation
LED PANEL PWR	For indication of unit activation
LED OVERLOAD	For indication of output voltages overload
cnctr OUTPUT I	Connector with voltage of 5 and 15 V
cnctr OUTPUT II	Connector with voltage of -15 V
cnctr OUTPUT III	Connector with voltage of 5…20 V
cnctr ВЫХОД ТР (Transformer Output)	Connector with voltage ($27\ ^{+7}_{-4}$)

Rear Panel

Drawing fan	For forced cooling
Fan Connector	For fan connection
Fuse 6.3 A (Power Unit)	In primary power supply circuit of the unit
Fuse 6.3 A (Transformer Power)	In transit power supply circuit of the unit
cnctr 27 V PWR	For connection of primary power supply circuit of the unit
cnctr PANEL PWR	For connection to БКК power supply unit
cnctr CHECK	For transfer of unit voltages for measurement and indication

Table 6.2 CENTER POWER UNIT Output Signals Matrix

Connector Name	Output Voltage (Volts)	Load current, A		Note
		Nomin.	Min.	
OUTPUT I	15.0	1.0	0.1	While using two connectors simultaneously, total load current should not exceed the maximum value
	5.0	3.5	0.1	
OUTPUT II	-15.0	1.0	0.1	
OUTPUT III	+5…+20	1.0	0.01	Nominal output voltages are set discretely at 5, 6, 7, 8, 9, 10, 12, 14,15, 18, 19, 20 V (discrete settings)

CENTER CONNECTOR CHECK provides:

Measurement and digital indication of DC voltage in the range from 0.5 to 20 V

Measurement of resistance in the range from 2 to 50 kΩ

Two-channel galvanic isolation of two external analog signals, supplied on telemetry connector on the unit front panel and their simultaneous output to telemetry systems

Switching of outgoing signals from peripheral devices, outgoing signals from complex GAMMA-1M, switching of interelectrode resistor circuits (МЭС) and БП output voltage to oscilloscope and voltmeter inputs depending on the operating mode, set with controls, located on the CENTER CONNECTOR CHECK front panel

Figure 6.46 CENTER CONNECTOR CHECK Front Panel

CENTER CONNECTOR CHECK Controls:

sw МЭС	For switching of МЭС circuits from EKG HARNESS connector to the voltmeter input
sw CHECK	For switching of БП output voltage to voltmeter input in the POWER UNIT position and input signals to the oscilloscope input in positions 2-11
sw V and k Ω	For selection of volt-ohmmeter operating mode
Connector EKG HARNESS	For switching of measured resistance circuits to the volt-ohmmeter input
Connector TELEMETRY	For two-channel galvanic isolation of two external analog signals, supplied on telemetry connector
Connector INPUT	For signal switching to oscilloscope output connector

OSCILLOSCOPE ОМЭЛ-4Б provides: Sequential display of signals transmitted to complex CENTER

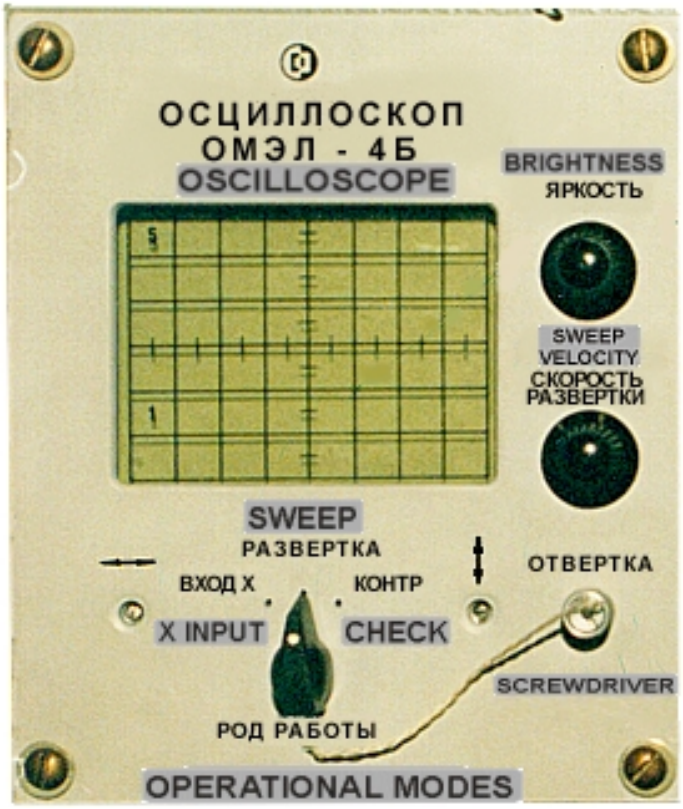


Figure 6.47 ОМЭЛ-4Б Front Panel

OSCILLOSCOPE Controls:

BRIGHTNESS	Brightness control
SWEEP VELOCITY	Sweep rate control
sw OPERATIONAL MODES	Selects type of operation
Screwdriver	Used to adjust potentiometers

Set МЭК-2 is intended for:

Joint operation of CENTER and peripheral devices, it represents a kit with cables, also containing kit МЭК-1 (with microphone, holder, tube, sheeting, spare parts)

6.4.1. TROUBLE SHOOTING

	Symptoms	Probable Cause	Corrective Action(s)
1.	When power supply is on ■ LED PANEL PWR	БП fuse 6.3 A has burnt out	Replace fuse
2.	When sw TRANSFORMER POWER is on there is no voltage on connector ВЫХОД ТР (Transformer Output)	БП fuse 6.3 A has burnt out	Replace fuse

6.5. REFLOTRON-4 ANALYZER

Purpose:

To conduct biochemical analysis of whole blood using the method of dry reagents

Required Hardware:

Analyzer Reflotron-4:

1. Analyzer Reflotron-4
2. Analyzer Reflotron-4 Accessories Kit:
   - Perforator Autoclix
   - Power cord
   - Pipette 32 µl
   - Cover

Reflotron-4 Kit:

1. Tips (in package)
2. Lancets
3. Platforms
4. Microvettes EDTA (red)
5. Microvettes LH (orange)
6. Bactericidal tissues
7. Bactericidal band-aid
8. Tissues (for measurement chamber cleaning)
9. Containers with microcapillaries
10. Waste disposal bag
11. Cover

Set of measuring strips (in plastic containers)

1. C H E K - reference strip (for calibration purposes)
2. G L U - glucose strip
3. H B - hemoglobin strip
4. C H O L - cholesterol strip
5. T G - triglyceride strip
6. U R E A - urea strip
7. G G T - G-glutamiltransferase strip
8. U A - uric acid strip
9. G O T - aspartate-aminotransferase strip
10. G P T - alanin-aminotransferase strip
11. B I L - bilirubin strip
12. A M Y L - A-amylase strip
13. C R E A - creatinine strip
14. C K - creatinkynase strip
15. P-AM - pancreatic amylase strip
16. HDLP - high-density cholesterol strip
17. Cover

Characteristics

Power Consumption:	40 W

Location:

Reflotron-4	In the bag, on pnl 336
Set of measuring strips	Medical Locker, container 7

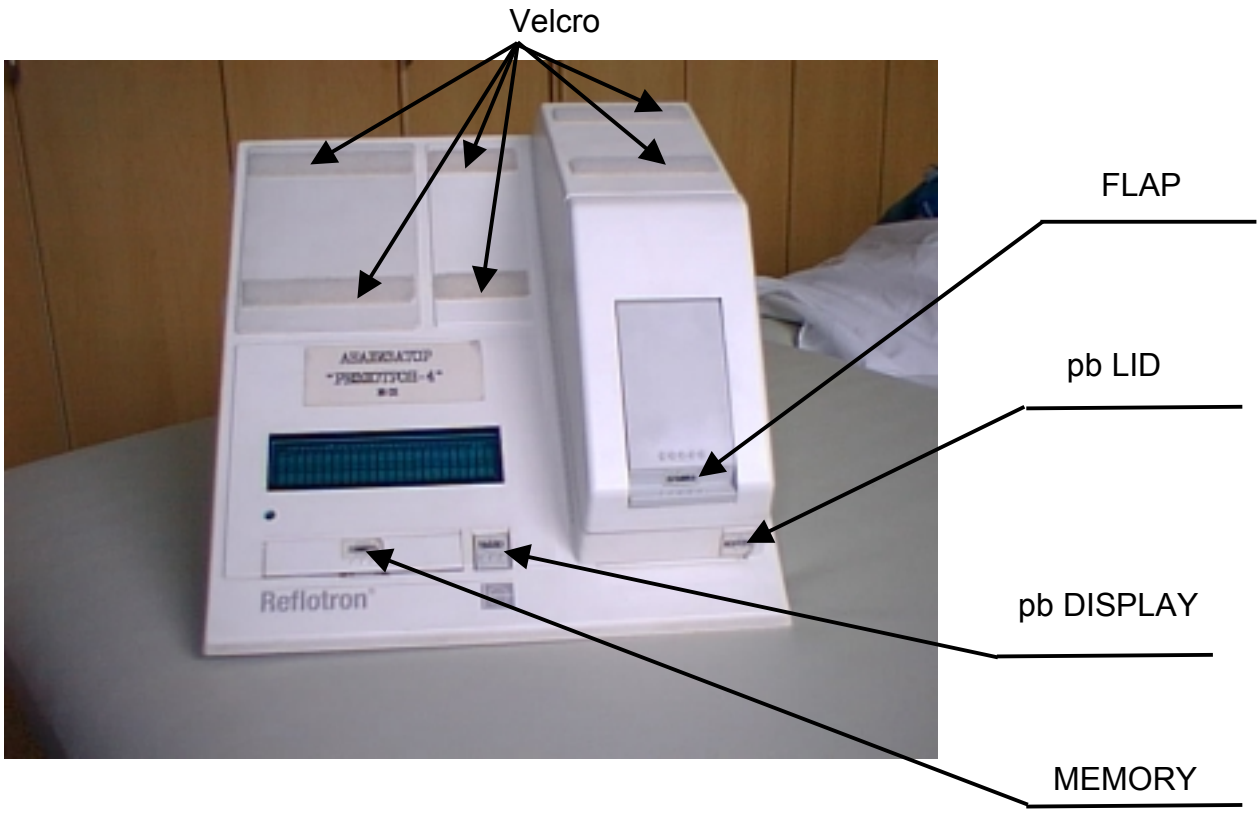


Figure 6.48 Reflotron-4 Front Panel (General View)

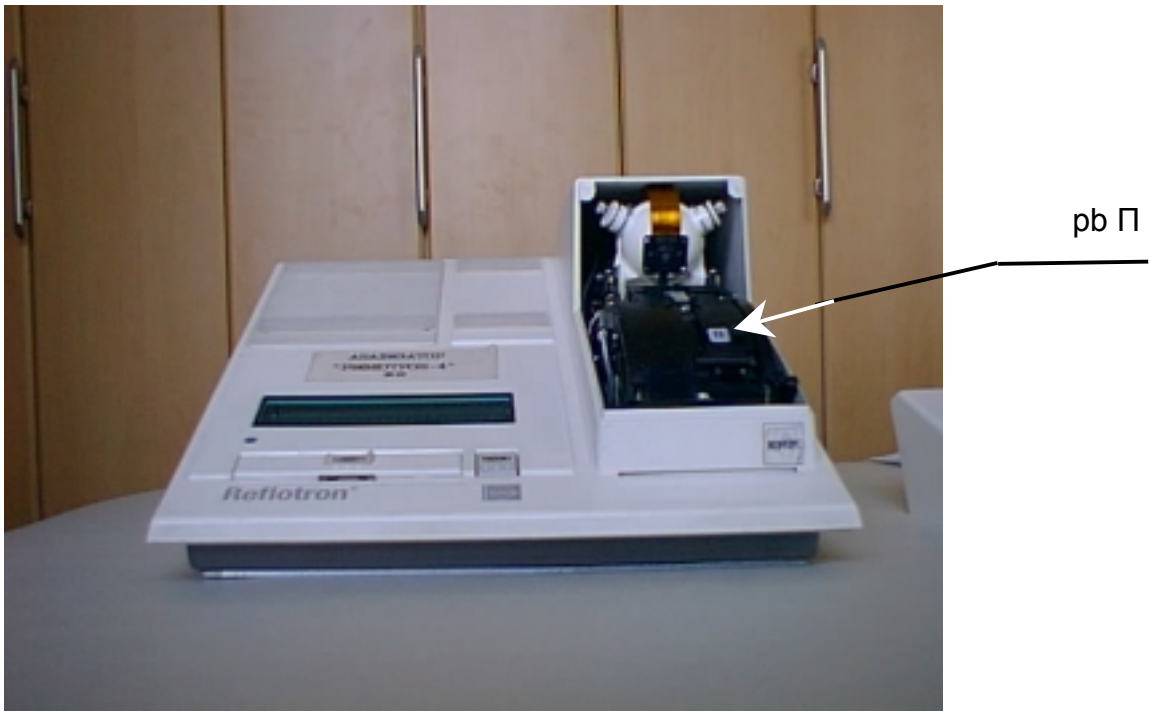


Figure 6.49 Reflotron-4 with measuring chamber casing removed (General View)

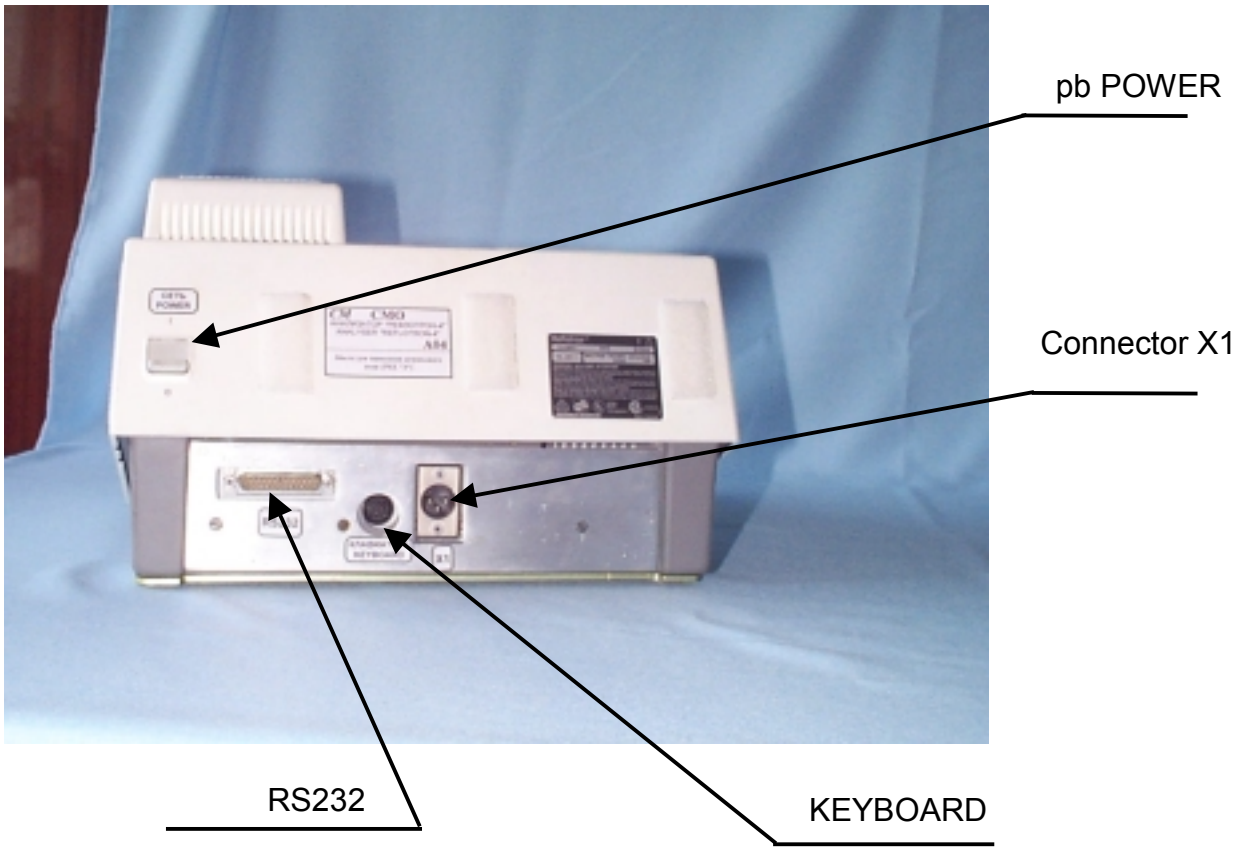


Figure 6.50 Reflotron-4 (Rear General View)

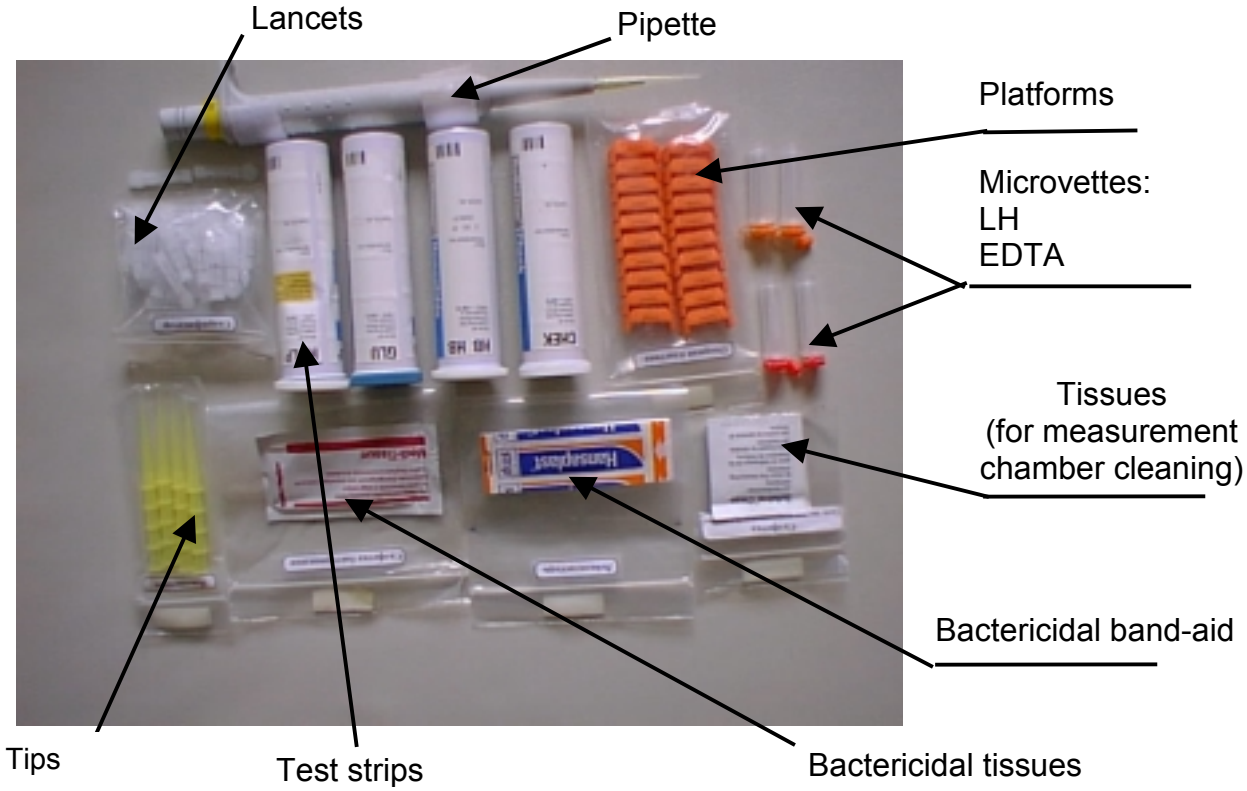


Figure 6.51 Reflotron-4 kit consumables, measuring strips set, pipette

6.6. MINICENTRIFUGE M-1100

Purpose:

Measurement of relative content of formed elements in human blood (hematocrit number) by means of mechanical separation of blood formed elements and plasma through centrifugation of blood in microcapillary tubes

Centrifugation is performed in automatic mode. Centrifugation time - 3 min 20 sec

Even number of microcapillary tubes, located one across each other and in a symmetrical order, are processed simultaneously

Required Hardware:

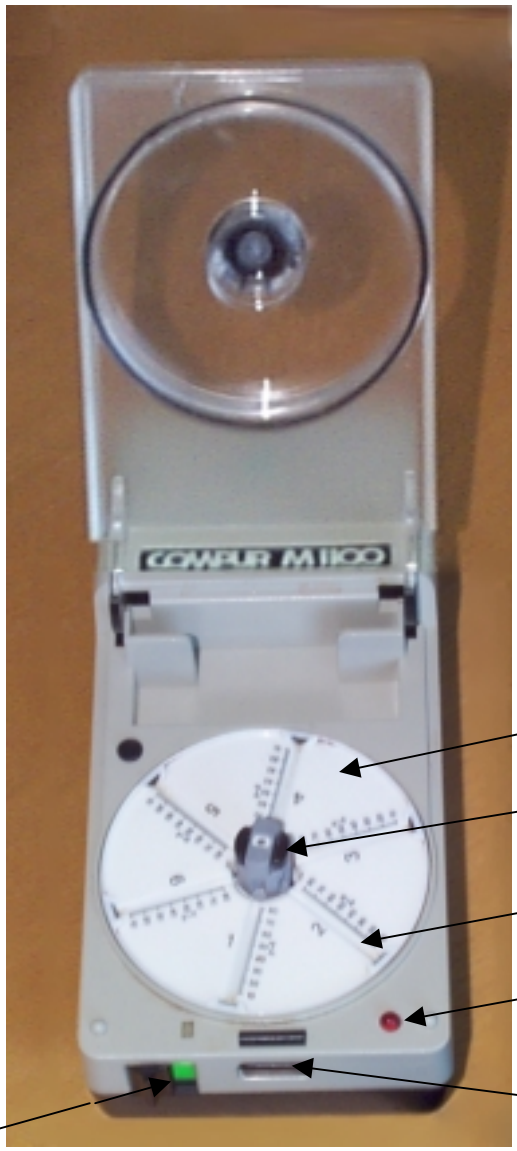
Kit M-1100:
- minicentrifuge M-1100 (МЦФ)
- Magnifier
- Forceps
- Brush
- Case

Set of power batteries (6 battery pack)

Minicentrifuge Power Source:

Autonomous (6 elements of 343 or R14 type)
One set of power batteries provides a minimum of 25 cycles of centrifugation

Location – In the bag on pnl 336



Rotor

Strap

Micro tube liner

LED

Cover lock

Power switch ПИТ (ВКЛ (On) - red, ОТКЛ (Off) - green)

Figure 6.52 Minicentrifuge M-1100

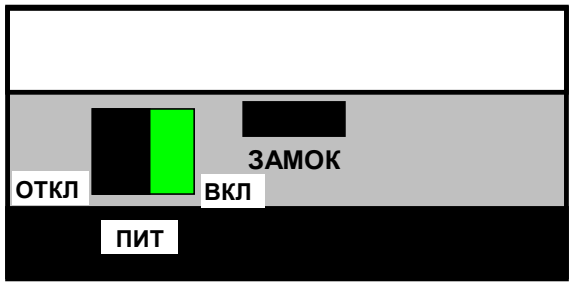


Figure 6.53 Minicentrifuge M-1100 (Front View)

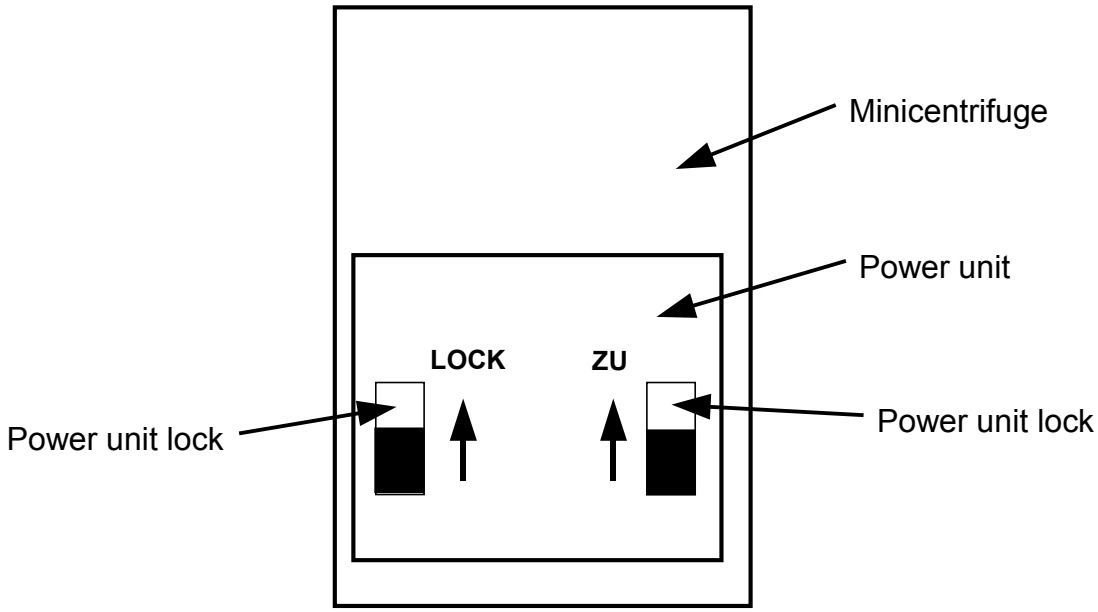


Figure 6.54 Minicentrifuge M-1100 (Bottom View)

Figure 6.55 Power unit

6.7. ECG RECORDER 90205

Purpose:

Recording of dynamic electrocardiograms (ДЭКГ), obtained from two leads within 24 hours

Hardware Components:

ECG Recorder 90205 kit (ECG Recorder in a pouch, belt and patient's cable)
Kit with ECG Recorder 90205 accessories (electrodes, tissue, razor, tape cassette and battery)

Location – Medical locker, container 5

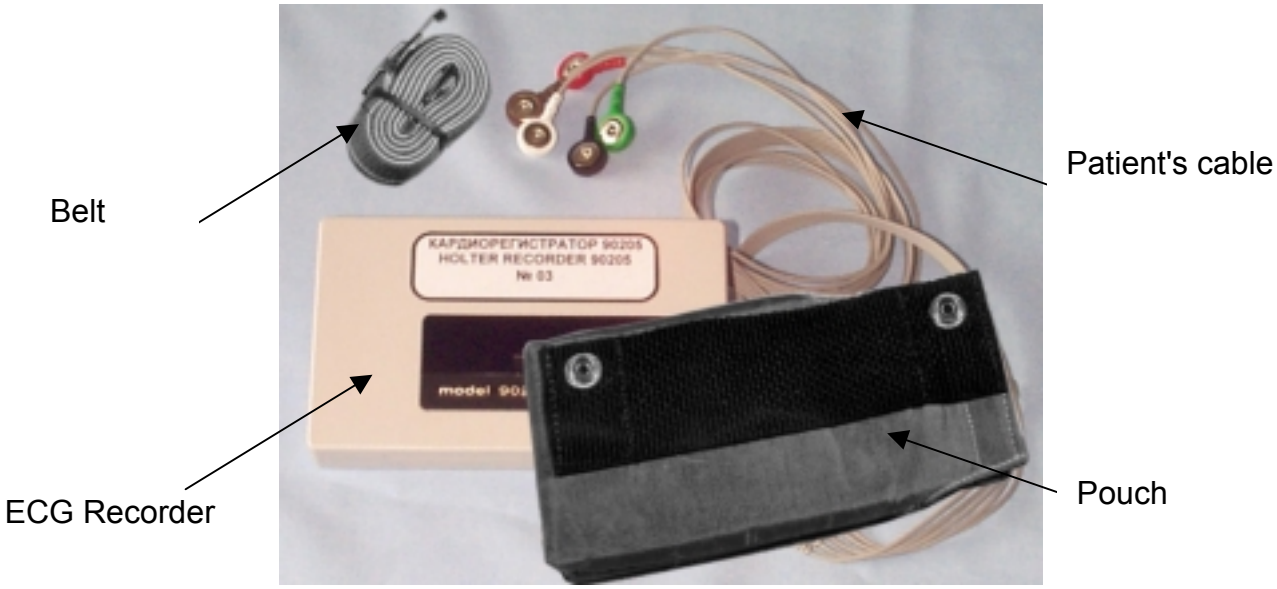


Figure 6.56 ECG RECORDER 90205 Kit

Controls and Displays: (Figure 6.57, Figure 6.58 p. 6-56)

pb **S** and pb **A** - for time correction

Display - for current time

pb EVENT - for event mark

Closing ECG Recorder cover starts tape drive mechanism motor
Opening ECG Recorder cover stops tape drive mechanism motor

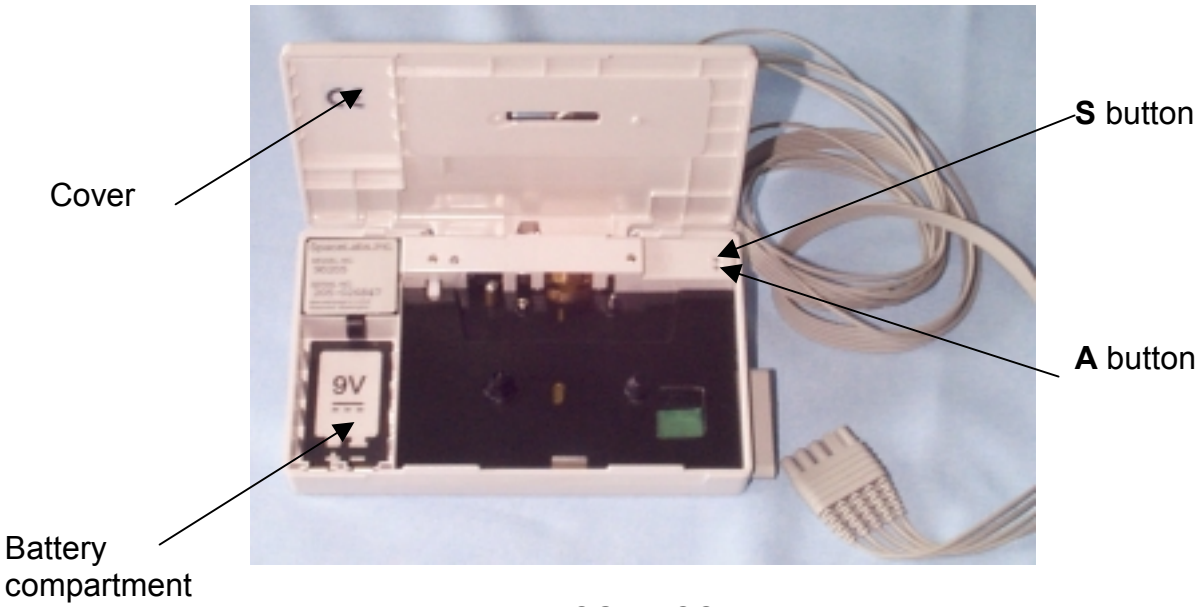


Figure 6.57 ECG RECORDER 90205

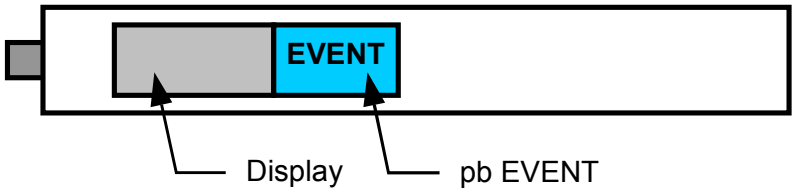


Figure 6.58 ECG RECORDER 90205 (Rear View)

6.7.1. TROUBLE SHOOTING

	Symptom	Probable cause	Corrective Action(s)
1.	No time reading on a display after a battery installation	1. Battery polarity is wrong	Install a battery observing the right polarity
		2. Voltage < 8 V	Replace a battery
2.	Motor of the tape drive mechanism is not activated when cover is closed	Cover is not closed firmly	Close cover until it clicks

6.8. URILUX UNIT

Purpose:

Urine biochemical test
Test is conducted on the first morning void, obtained before meals

Hardware Components:

URILUX unit (with pwr cable labeled УРОЛЮКС-БК)
Urilux kit:
canister with control strips labeled Control -Test M
paper for built-in printer
cartridge for built-in printer
Kit УБИМ-10У

Characteristics:

Power supply from Center Power Unit 9 V

Location – in a bag on pnl 336

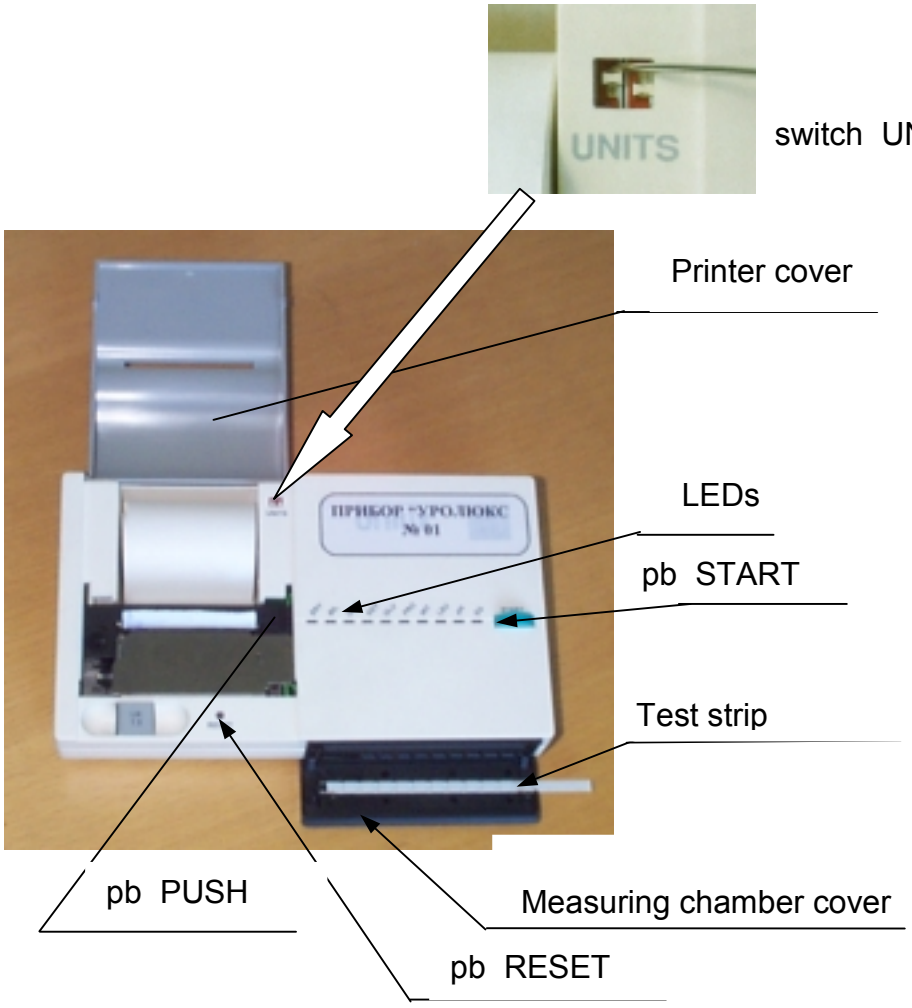


Figure 6.59 URILUX Unit

6.8.1. PAPER AND CARTRIDGE INSTALLATION

1. Open printer cover
   Install cartridge with ink ribbon (if necessary)
   ↓ label PUSH on cartridge
   Install a roll of paper into paper holder

2. Insert tip of paper roll into a groove on the printer

3. ↓ pb START
   ◁ all upper panel LEDs light up sequentially

4. After the printer reels off app. 5-7 cm of paper:
   ↓ pb START (to stop the printer feeder motor)
   Pass paper through the slot on the printer cover and Cl cover firmly

5. When replacing cartridge for a new one:
   ↓ down the right corner of cartridge (marked PUSH)
   Take the cartridge out from its support
   Discard the used cartridge
   Insert the new cartridge

7. PLASMA – 03 COMPLEX

PLASMA – 03 Components:

KRIOGEM-03 refrigerator

PLASMA-03 centrifuge components:
- PLASMA-03 centrifuge
- Canister
- Vial counterweight
- Syringe counterweight

Container KB-03:
- Cold accumulator AX-03
- Container housing
- Container cover
- Cloth cover

PLASMA-03 accessories kit:
- Elastic bungee
- Clamp
- Fuse (5 A)
- Cover

PLASMA-03 consumable set:
- SARSTEDT syringe, 9 ml, with gel
- BUTTERFLY type canule with adapter
- Bactericidal tissue
- Bactericidal band-aid
- Waste bag
- Ziplock bag

Location:

Container KB-03	(TBD)
PLASMA-03 accessories kit PLASMA-03 consumables set	Medical locker, container 5
PLASMA-03 centrifuge	Pnl 226
KRIOGEM-03 refrigerator	Between pnls 234 and 235

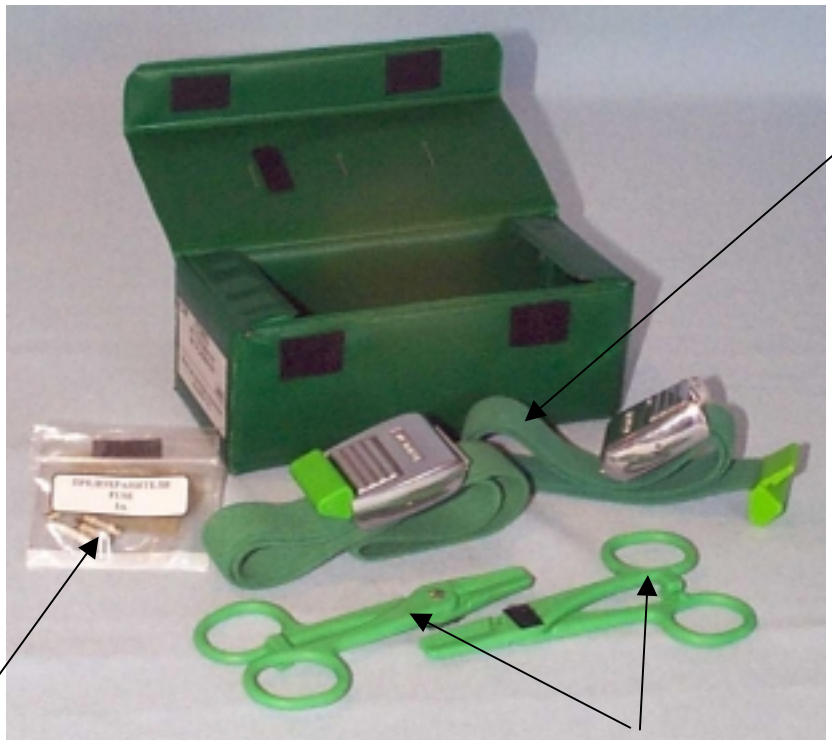


Figure 7.1 PLASMA-03 accessories kit

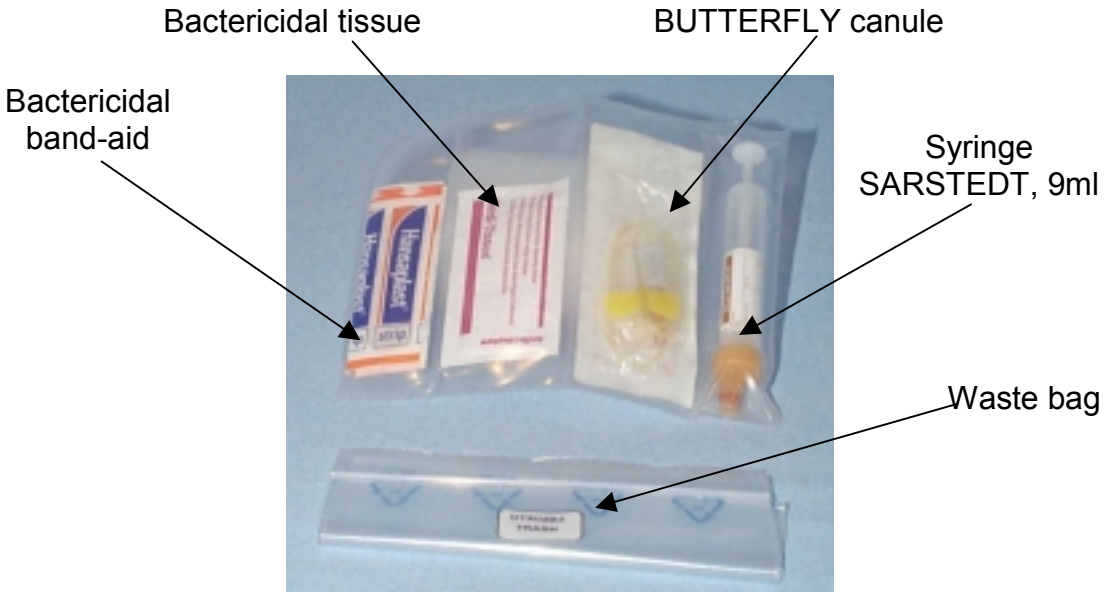


Figure 7.2 PLASMA-03 Consumables Set

7.1. KRIOGEM-03 REFRIGERATOR

Purpose:

Stowage and freezing of blood and saliva samples or use as a incubator

KRIOGEM-03 Refrigerator Temperature Modes:

KRIOGEM-03 refrigerator provides the following temperature modes:

+37±0.5 °C, +29±1 °C, +20±1 °C, +8±1 °C, +4±1 °C, -22±2 °C

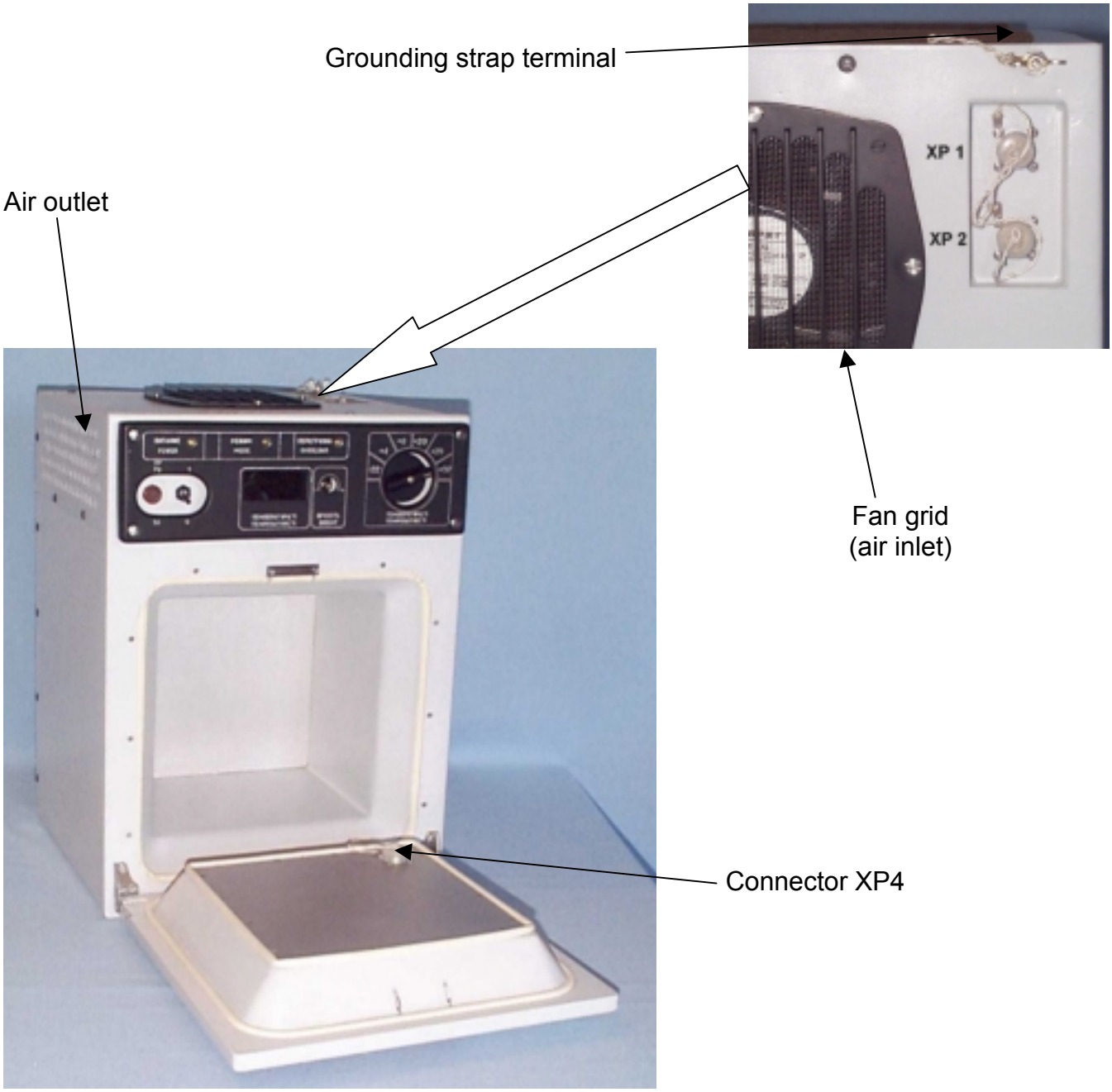


Figure 7.3 KRIOGEM-03 refrigerator

Characteristics:

Power consumption:	50 W
	110 W (when starting the mode -22°C)

Figure 7.4 KRIOGEM-03 refrigerator front panel

7.1.1. KRIOGEM-03 SETUP

1. Unstow KRIOGEM-03 refrigerator

2. Locate coiled ends of refrigerator power cable 17КС.10Ю 8210А-7830 and telemetry cable 17КС.42Ю 8242А-3050 behind pnl 234

3. Install refrigerator between panels 234 and 235 (clear zone around refrigerator should be not less than 150 mm)

4. Secure refrigerator with Velcro fasteners (located on back wall along refrigerator angles)

KRIOGEM-03
ППС-24
5. √ 0
√ KRIOGEM FREEZER

KRIOGEM-03
6. Remove protective caps from connectors XP1 and XP2

KRIOGEM-03
7. cnctr XP1 of cbl 17КС.10Ю 8210А-7830→|←cnctr XP1
cnctr XP2 of cbl 17КС.42Ю 8242А-3050→|←cnctr XP2

8. Find free end of grounding strap on bulkhead behind panels 234 and 235

9. Free end of grounding strap →|← grounding strap terminal on KRIOGEM-03 upper cover

7.1.2. KRIOGEM-03 ACTIVATION IN MODE -22°C

NOTE

1. When KRIOGEM-03 is in mode - 22°C then it should be activated:
   - 20 hours prior to the experiment if two cold accumulators are installed in it
   - 4 hours prior to the experiment if cold accumulators are not installed in it
2. Temperature mode is selected using switch TEMPERATURE °C both with activated, and with the deactivated refrigerator

KRIOGEM-03 1. √ 0
ППС-24 √ KRIOGEM FREEZER
Install cold accumulators (see Sect 7.1.5 p. 7-8)

ППС-24 2. √ KRIOGEM FREEZER

KRIOGEM-03 3. 1 □ (green) LED POWER
■ (red) OVERLOAD (briefly)
fan activation
TEMPERATURE °C → -22 (current value of temperature appears on display)

4. □ (green) LED MODE (when operation chamber temperature reaches -22°C)

****
****
If □ (red) LED OVERLOAD
Perform Sect. 7.1.7 steps 4, 5 p. 7-11
Report to MCC
****

7.1.3. KRIOGEM-03 ACTIVATION IN INCUBATOR MODE

NOTE

1. KRIOGEM-03 is activated 1 hour prior to the experiment in incubator mode
2. Temperature is selected using TEMPERATURE °C knob with refrigerator activated and deactivated

KRIOGEM-03 ППС-24 1. √ 0
√ KRIOGEM FREEZER

ППС-24 2. KRIOGEM FREEZER

KRIOGEM-03 3. 1 (green) LED POWER
(red) OVERLOAD (briefly)
fan activation
TEMPERATURE °C → to required mode (current value of temperature appears on display)

4. (green) LED MODE (when operation chamber temperature reaches selected temperature)

****
****
If (red) LED OVERLOAD
see Sect. 7.1.7 steps 4, 5 p. 7-11
Report to MCC
****

7.1.4. KRIOGEM-03 REFRIGERATOR DEACTIVATION

KRIOGEM-03
ППС-24

1. √ 0 ■ LED POWER
   √ KRIOGEM FREEZER

KRIOGEM-03

2. connector XP1 of cable 17КС.10Ю 8210A-7830 ←|→ connector XP1 (if necessary)
   connector XP2 of cable 17КС.42Ю 8242A-3050 ←|→ connector XP2 (if necessary)

3. Free end of grounding strap ←|→ grounding strap terminal on KRIOGEM-03 upper cover (if necessary)

4. Install Protective Covers on connectors XP1 and XP2 of KRIOGEM-03 (if necessary)

5. Open KRIOGEM-03 cover and retrieve contents from chamber

6. Stow cable 17КС 10Ю 8210A-7830 and cable 17КС 42Ю 8242A-3050 behind panel 234 (if necessary)

7. Stow end of grounding strap behind panels 234 and 235 (if necessary)

8. Clean chamber with dry wipe from Sanitary Hygiene Kit after defrosting (during operation at low temperatures)

9. Stow KRIOGEM-03 (if necessary)

7.1.5. INSTALLATION OF COLD ACCUMULATORS AX-03 IN KRIOGEM-03 REFRIGERATOR

Figure 7.5

1. Unstow containers KB-03 (2 ea.)

2. Unstow containers from cloth covers

3. Unfasten Velcro fasteners
   Remove container cover

4. Retrieve cold accumulators AX-03 from containers housing using the handle

5. Put AX-03 in KRIOGEM-03 refrigerator

6. Place containers KB-03 housing with covers in cloth covers
   Stow cloth covers with containers

7.1.6. CLOSEOUT OPERATIONS WITH COLD ACCUMULATORS AX – 03

NOTE

1. **Operations are performed directly prior to return of samples to the ground**
2. **Cold accumulator placement into thermal insulation (from refrigerator) container housing should be performed as soon as possible**

1. Unstow cloth covers with containers KB-03
   Retrieve containers housing from cloth covers

2. Retrieve cold accumulators AX-03 from KRIOGEM-03 refrigerator using the handle or the thermal insulation

3. Stow cold accumulators AX-03 in containers KB-03 housing

4. Cover containers
   Fasten Velcro fasteners
   Place containers in cloth covers

5. Transfer containers KB-03 in cloth covers to descent module

7.1.7. TROUBLE SHOOTING

CAUTION!
1. While performing operations refrigerator power should be off
2. In case of fan failure do not run refrigerator until fan is replaced

	Symptom	Probable Cause	Corrective Action(s)
1.	Refrigerator is not activated with ⏻ 1	Onboard power has not been supplied	⏻ KRIOGEM FREEZER on ППС-24
		Fuse has burnt out	Replace fuse with spare fuse from PLASMA-03 accessories kit
2.	Fan does not operate but LED and display are lit	Bad contact in fan power connector	Loosen 4 fan mounting screws, remove fan and restore good contact in connector
		Dirt sticking on fan propeller	Loosen 4 fan mounting screws, remove fan and clean fan propeller of dirt
		Fan failure	Replace fan
3.	Fan is operating, all LEDs are lit, display is not lit	Display brightness was reduced to minimum	Increase display brightness using trimming resistance BRIGHT

4.	□ LED OVERLOAD	Air flow to fan is blocked	Clean fan grid of dirt
5.	□ LED OVERLOAD, fan does not operate	Bad contact in fan power connector	Loosen 4 fan mounting screws, remove fan and restore good contact in connector
		Dirt sticking on fan propeller	Loosen 4 fan mounting screws, remove fan and clean fan propeller of dirt
		Fan failure	Replace fan

7.2. PLASMA-03 CENTRIFUGE

Puprose:

Performs separation of blood samples (in syringes) to serum and formed elements via centrifugation

Saliva samples centrifugation in transfer vials

Hardware:

PLASMA-03 centrifuge
Canister
Vial counterweight
Syringe counterweight

Characteristics:

Power consumption: no less than 150 W

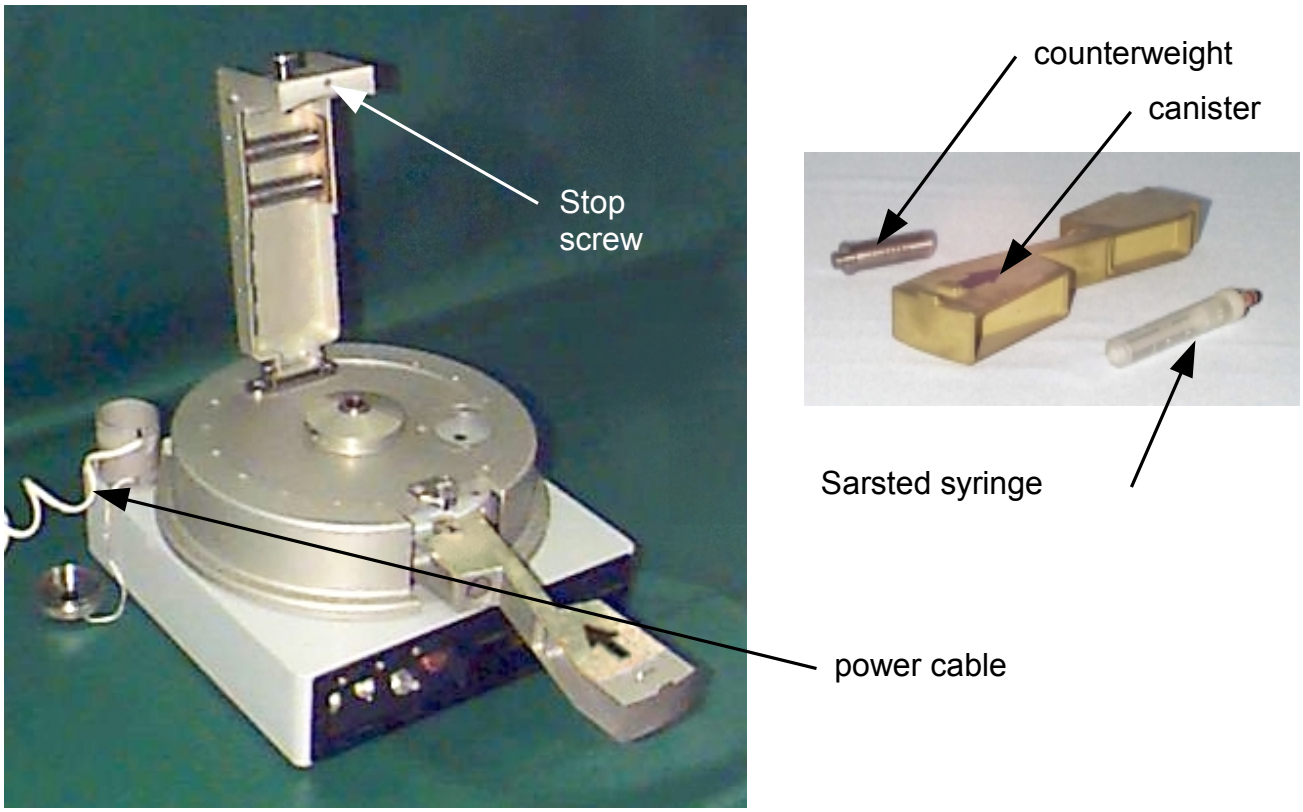


Figure 7.6 Plasma-03 Centrifuge

Figure 7.7 Plasma-03 Centrifuge Front Panel

7.2.1. CENTRIFUGE SETUP

1. Unstow centrifuge (panel 226)

2. Using Velcro secure centrifuge in work station in РБС-10/3 power outlet area

Centrifuge

3. √ POWER → 0
   √cover is safely locked

4. Unstow power cable from centrifuge cable compartment on centrifuge housing
   Remove protective cover from power cable connector X1

5. РБС-10/3
   connector X1 of power cable →|← connector X1 of РБС-10/3

6. Attach power cable grounding strap to one of screws (M6) on РБС-10/3

7.2.2. SAMPLE CENTRIFUGATION

NOTE

KRIOGEM-03 refrigerator should be activated at least 20 hours prior to operations in mode -22°C, with cold accumulators AX-03 placed in its chamber

1. Pull lock handle and raise cover until it clicks

2. Rotate centrifuge tray manually until container is fully aligned with centrifuge tray opening

3. Extract container from centrifuge tray

NOTE

1. When operating centrifuge, ensure centrifuge has either two syringes filled with blood installed in both sockets, or just one filled syringe and counterweight labeled "ШПРИЦ"
2. When operating centrifuge, ensure centrifuge has either two vials filled with saliva installed in both sockets, or just one filled vial and counterweight labeled "ПРОБИРКА"
3. Counterweights are stowed on the inner side of centrifuge cover

4. Snap off syringe plunger rod and install syringe (filled with blood) or vial (filled with saliva) into container (if necessary, use counterweight)

5. Place container all the way into a centrifuge tray opening
   Lower cover and until lock engages

6. ⏻ РБС-10/3
   Centrifuge ⏻ POWER → 1 □ (green) LED POWER
   □ (yellow) LED STOP

00:00:00 7. ↓ pb START ■ (yellow) LED STOP
00:02:00 □ (green) LED MODE (Centrifuge tray reached required rpm)
Centrifugation time 4 min

8. On centrifugation completion:
   ■ (green) LED MODE
   □ (yellow) LED STOP (Centrifuge tray stops)

NOTE

1. For emergency stop of centrifuge, ↓ pb STOP, and ◅ □ (yellow) LED STOP
2. Emergency powerdown and deceleration can be triggered by an attempt to open the cover by pulling at lock handle on the working centrifuge

Centrifuge 9. ⏻ POWER → 0 ■ (green) LED POWER
■ (yellow) LED STOP
■ (green) LED MODE

10. Pull lock handle and raise cover until it clicks

11. Rotate centrifuge tray manually until container is fully aligned with centrifuge tray opening

12. Extract container with samples inside from centrifuge tray
    Extract syringe or vial from container

13. Op KRIOGEM-03 refrigerator door

14. Place syringes or vials into cold accumulator piercing foil in sockets

15. Cl KRIOGEM-03 refrigerator door

NOTE

In case of full load of KRIOGEM-03 refrigerator (2 cold accumulators AX-03 and 12 filled syringes (vials)) freezing time is not less than 24 hours

16. Take counterweight out of container

17. Place counterweight into storage location (inner side of centrifuge cover)

18. Insert container all the way into centrifuge tray opening

19. Lower cover and engage lock

20. ⏚РБС-10/3

7.2.3. CLOSEOUT OPERATIONS

1. √counterweights are placed in nominal storage location (inner side of centrifuge cover)

2. Engage lock on centrifuge cover

Centrifuge

3. √ ⏚POWER → 0

4. √ ⏚ РБС-10/3

5. connector X1 of power cable ↔ connector X1 of РБС-10/3

6. Power cable grounding strap ↔ screw (M6) on РБС-10/3
   Install protective cover on connector X1 of power cable

7. Stow power cable into centrifuge cable compartment on centrifuge housing and close with cover

8. Stow centrifuge

7.2.4. TROUBLE SHOOTING

CAUTION!

When operating centrifuge power should be off

Symtoms	Probable Cause	Corrective Action(s)
1. Centrifuge is not activated with ☝POWER → 1	Onboard power has not been supplied	☝РБС-10/3
	Fuse 5A has burnt out	Replace fuse with spare fuse from PLASMA-03 accessories kit
2. Centrifuge tray does not operate when pressing pb START	Untightened stop screw, which activates block microswitch	With closed protective cover stop screw to microswitch activation, click should be heard

8. ECOSPHERA EQUIPMENT

Purpose:

The equipment is intended to determine:
- microbial contamination of ISS atmosphere
- total bacterial and fungal microflora counts
- microflora composition according to morphologic criteria of microorganism colonies

Hardware:

Ecosphera sampler set:
- Air sampler
- Ecosphera charger
- БП ЭКОСФЕРА (Ecosphera power supply unit)
- Tray for Petri dish storage
- Ecosphera cable (to charge Ecosphera power supply unit via Ecosphera charger)

Ecosphera kit includes:
- Petri dishes with MEDIA 1 (8 ea. + 2 spares)
- Petri dishes with MEDIA 2 (8 ea. + 2 spares)

Location:

Ecosphera sampler set	FGB [TBD]
Ecosphera kit	Medical locker, container 6

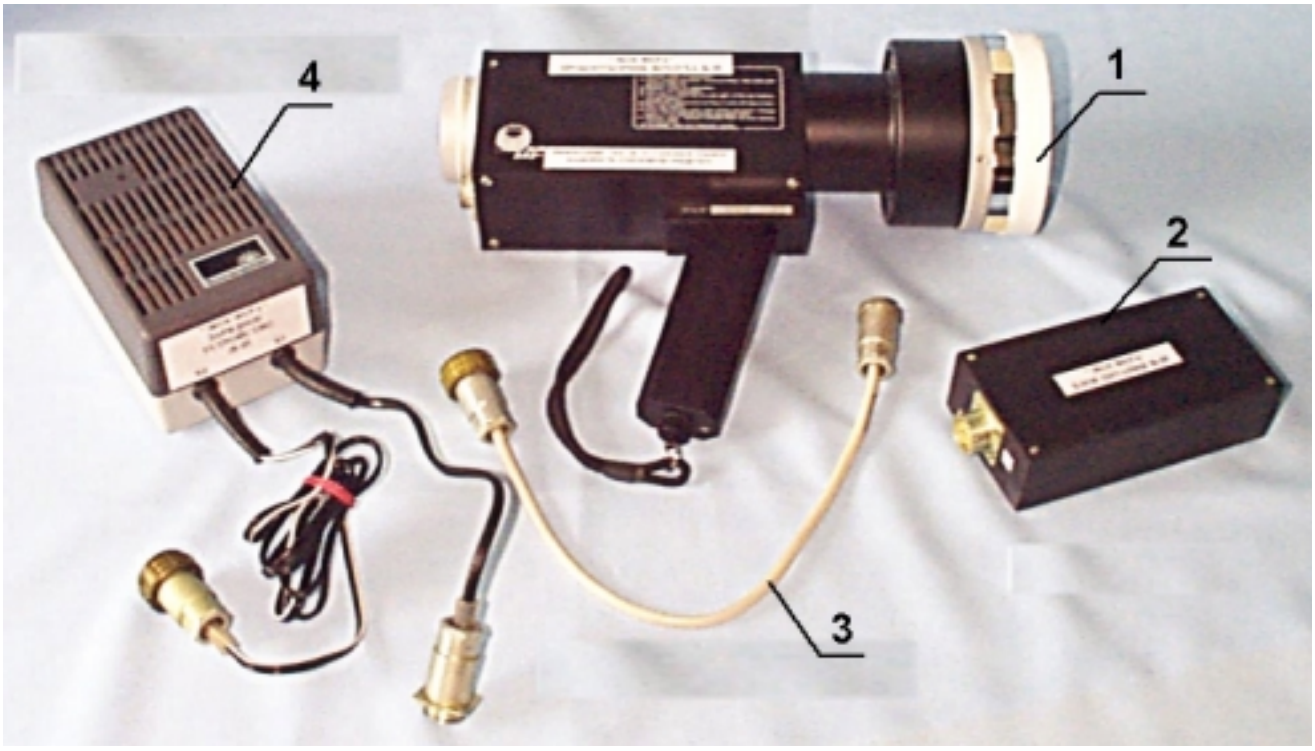


Figure 8.1 Ecosphera Equipment

1 – Ecosphera Air Sampler
2 – Ecosphera Power Supply Unit
3 – Ecosphera Cable
4 – Ecosphera Charger

ECOSPHERA Air Sampler

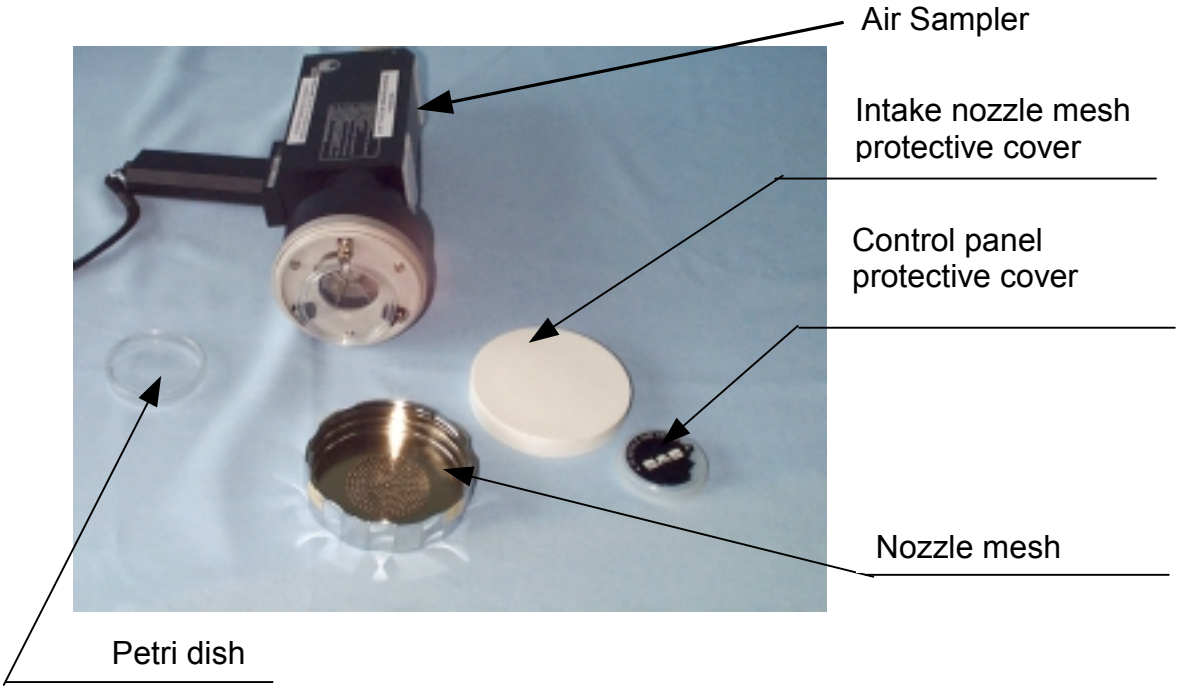


Figure 8.2 Air Sampler

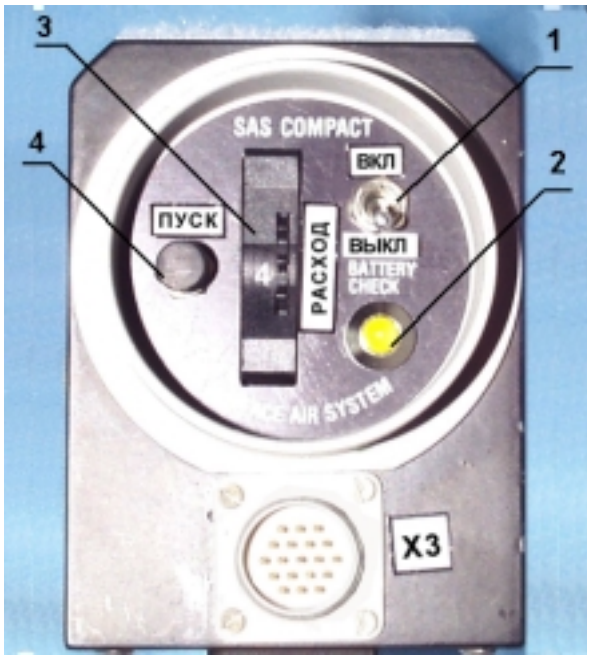


Figure 8.3 Air Sampler Control Panel

Functions of Air Sampler Controls:

1.	sw ON-OFF	Power On and Power Off
2.	LED	Power Indicator
3.	sw РАСХОД	Selects intake fan motor operation time 0---15 (16 positions)
4.	pb ПУСК	Starts the intake fan motor

БП ЭКОСФЕРА (ECOSPHERA Power Supply Unit)

БП ЭКОСФЕРА is intended for supply power to air sampler motor from 6 V rechargeable batteries

БП ЭКОСФЕРА attaches to air sampler body via Velcro clip

ECOSPHERA Charger:

Ecospera charger is intended for power supply unit recharging

ECOSPHERA Kit:

Ecospera kit consists of two separate compartments containing:
eight Petri dishes with MEDIA 1 to collect bacterial flora samples
eight Petri dishes with MEDIA 2 to collect fungal flora samples
two spare Petri dishes for MEDIA 1 and MEDIA 2 (without indication of sample collection location)

Petri dishes are labeled as follows:
MEDIA 1/2/ location X (X from 1 to 8 – sample collection location number)

Table indicating the collection locations is provided on the internal surface of Ecosphera kit cover

Figure 8.4 Ecosphera Kit

For notes

9. HEARING PROTECTION SET

Purpose:

Individual systems acoustic noise protection of cosmonauts' hearing

Hardware:

Case
Earphones
Charge unit
Earphones to external comm devices interconnecting cable [CK]

9.1. USE OF EARPHONES

It is recommended to use earphones constantly, especially when resting, listening to the music and for conducting amateur comm passes using earphones as external loudspeaker

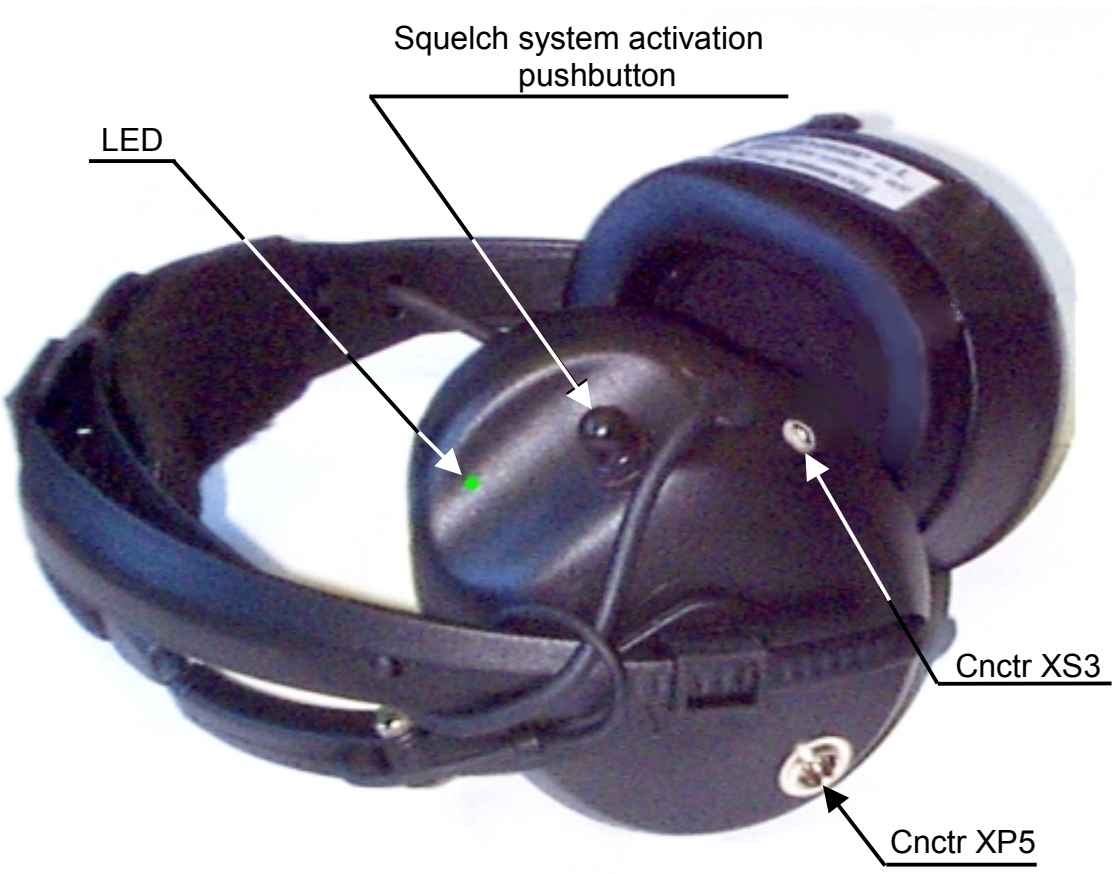


Figure 9.1 Earphones (General View)

9.1.1. USE OF EARPHONES FOR HEARING PROTECTION

1. Unstow earphones from case

2. ↓ pb on earphones □ LED on earphones (see Figure 9.1 p. 9-1) **********

   * ********** *

   If ■ LED:

   Charge batteries see Sect. 9.2 p. 9-4

   * ********** *

3. Don earphones

4. If necessary adjust earphones to head size moving earpads along headband
   Ensure earpads are adjust snuggly on head (earphones pressing force is adjusted using upper Velcro)

> NOTE
>
> 1. Duration of earphones wearing is determined per crew discretion
> 2. Squelch system operation time with fully charged battery is 30 - 50 hours
> 3. Earphones wearing does not distort audio signals and voice perception

5. Doff earphones when use is complete

6. ↓ pb on earphones ■ LED on earphones

9.1.2. USE OF EARPHONES FOR COMM

1. cnctr XS5 of interconnecting cable CK →|← cnctr XP5 of earphones
2. cnctr XP7 of interconnecting cable CK →|← external comm device
3. ↓ pb on earphones □ LED on earphones
4. Don earphones

> NOTE
>
> When earphones are powered, together with active squelch at frequencies lower than 800 Hz, there is additional multiplication of incoming signal per 3-4 decibels at 800 - 1500 Hz voice range frequencies

5. When operation is complete:
   Doff earphones
   ↓ pb on earphones ■ LED on earphones
6. cnctr XP7 of cable CK ←|→ external comm device
7. cnctr XS5 oc cable CK ←|→ cnctr XP5 of earphones by pressing lock on cnctr

9.2. BATTERY CHARGE

NOTE

1. While charging battery, earphones power should be off
2. Each earpad has connector for batteries charge (XS3 and XS4)
3. To raise battery cycle life it is recommended to charge battery after complete discharge

1. Configure equipment per Figure 9.2 p. 9-5

2. ⏻ РБС-10/3

3. ⏻ sw on charge unit □ (green) LED on charge unit
□ (red) LED on charge unit **********

* ********** *

If □ (red) LED on charge unit
■ (green) LED on charge unit
⏻ sw on charge unit immediately
(short circuit in output circuit is possible)
Disassemble equipment (see Figure 9.2 p. 9-5)
Report to MCC

If □ (green) LED on charge unit
■ (red) LED on charge unit
√ cnctr XP3 and cnctr XS3(XS4)
are reliably mated

* ********** *

NOTE

1. Battery charge time is 10-12 hours
2. Charge may be stopped and earphones may be used at any time
3. Earphones can be used during battery charge, in this case charge time should be proportionally increased

4. When battery charge is complete:
⏻ sw on charge unit ■ (green) LED
■ (red) LED

5. ⏻ РБС-10/3

6. Disassemble equipment per Figure 9.2 p. 9-5

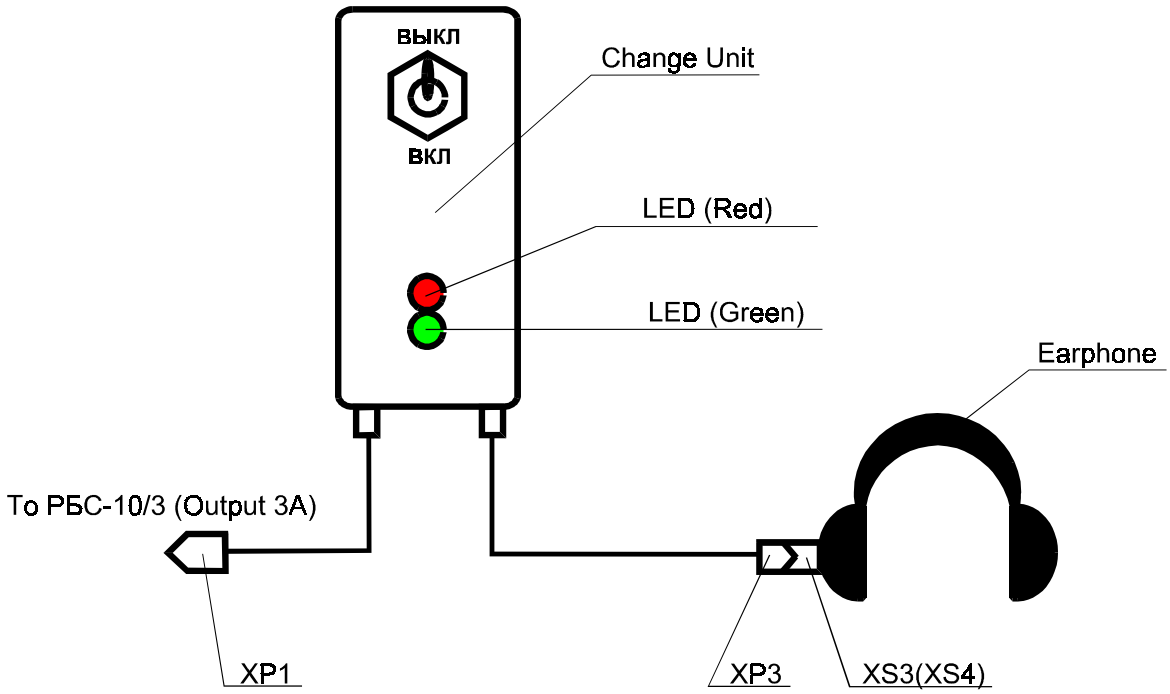


Figure 9.2 Battery charge diagram

For notes